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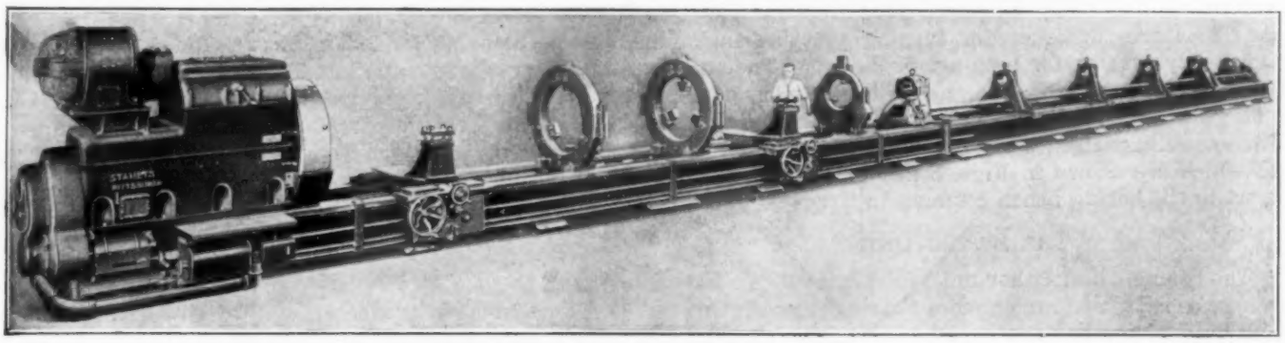


The Stamets Gun-Boring Lathe

By E. L. DUNN, Associate Editor, *American Machinist*

While the great war is ended we must not forget that the need for large guns still exists. The fact that machines of the type described are being installed will make this article of interest to many of our readers.

THE United States Government, at the beginning of the war, was confronted with many problems concerning the production of war material, and there was, perhaps, no single item of greater importance than that of large-caliber guns. The need of these was so urgent that, in many instances, they were taken from the regular equipment of battleships, and the demand naturally increased with the troop movements overseas. There was not only a dearth of big guns, but, equally important, was a lack of facilities for their manufacture, including gun-boring lathes. Some lathes of large size might be adapted for turning the guns, but the boring operation requires a special lathe designed for that purpose. William K. Stamets, Pittsburgh, Penn., a manufacturer acquainted with the Government's requirements in the matter of big guns, undertook the making of a gun-boring lathe and delegated R. L. Hibbard to do the designing. The bed, of a length to suit requirements, is made of two I-sections with flat ways, affording exceptionally large wearing surfaces. The two I-sections are solidly connected by inverted U-shaped cross-members, placed every 24 in. midway between the I-sections and, extending the full length of the bed, is an inverted U-section which provides further rigidity and serves to support the large rack located centrally in the bed.

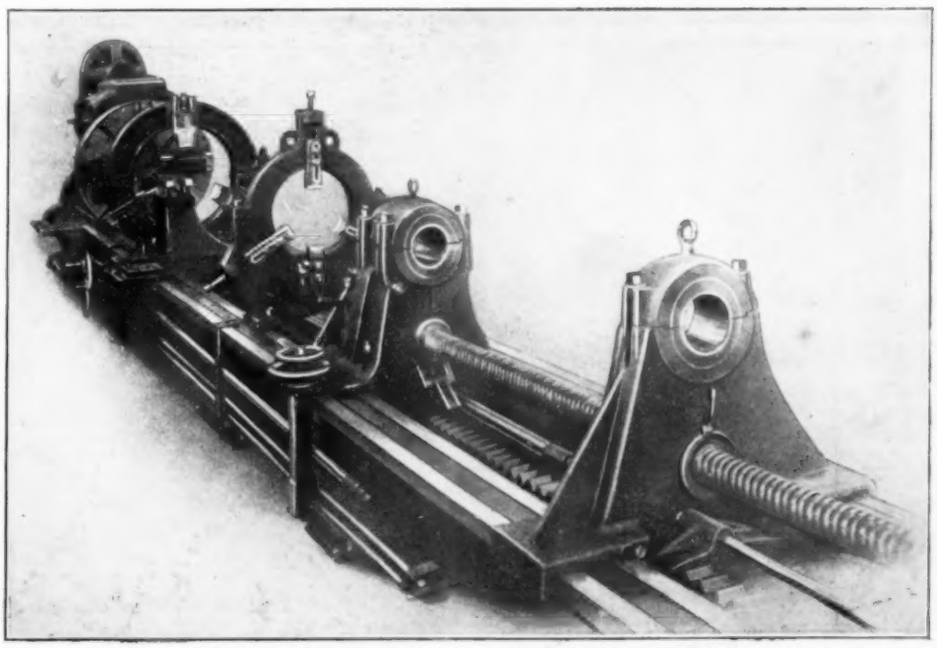


FIG. 1. FEED SCREW AND RACK ARRANGEMENT

The rack is a means to resist the heavy thrust caused by the boring operation; a pawl attached to the fixed bar support engages the rack, as shown in Fig. 1, and prevents slippage of the boring-bar unit. The bed is built of sections usually 25 ft. in length and provided with feet at frequent intervals. The headstock totally incloses all working parts and acts as a reservoir for the lubricating oil. Submerged in the oil is a gear-driven pump which supplies oil to a second reservoir located in the top of the head, from which it is conducted through pipes and distributed to all bearings requiring lubrication. A covered opening is provided in the headstock so that the pump is easily accessible.

All bearings are bronze bushed, the main spindle bearings being of box-type construction, permitting adjustment in case of wear. The spindle and shafts are of high-carbon steel, the main spindle being provided with an integral flange to which the faceplate is securely bolted. All pinions are made from alloy steel forgings and all gears are of steel, including the internal gear that is forced into the back of the faceplate under heavy pressure. The drive pinion engaging the internal gear is forged integral with its shaft and is made of high-grade alloy steel. The

speed changes are accomplished through sliding gears operated by means of a conveniently located handle.

The main driving motor is mounted on the headstock, a silent pinion being employed for direct drive. Two carriages are furnished for turning spot bearings for the steadyrests, or for turning for defects The steadyrests that support the weight of the gun, as may be noted from Fig. 2, have ample bearing surfaces suitable for excessive weights. The boring-bar unit, two views of which are shown in Figs. 3 and 4, is a decided contrast to the boring bench common to lathes of this type.

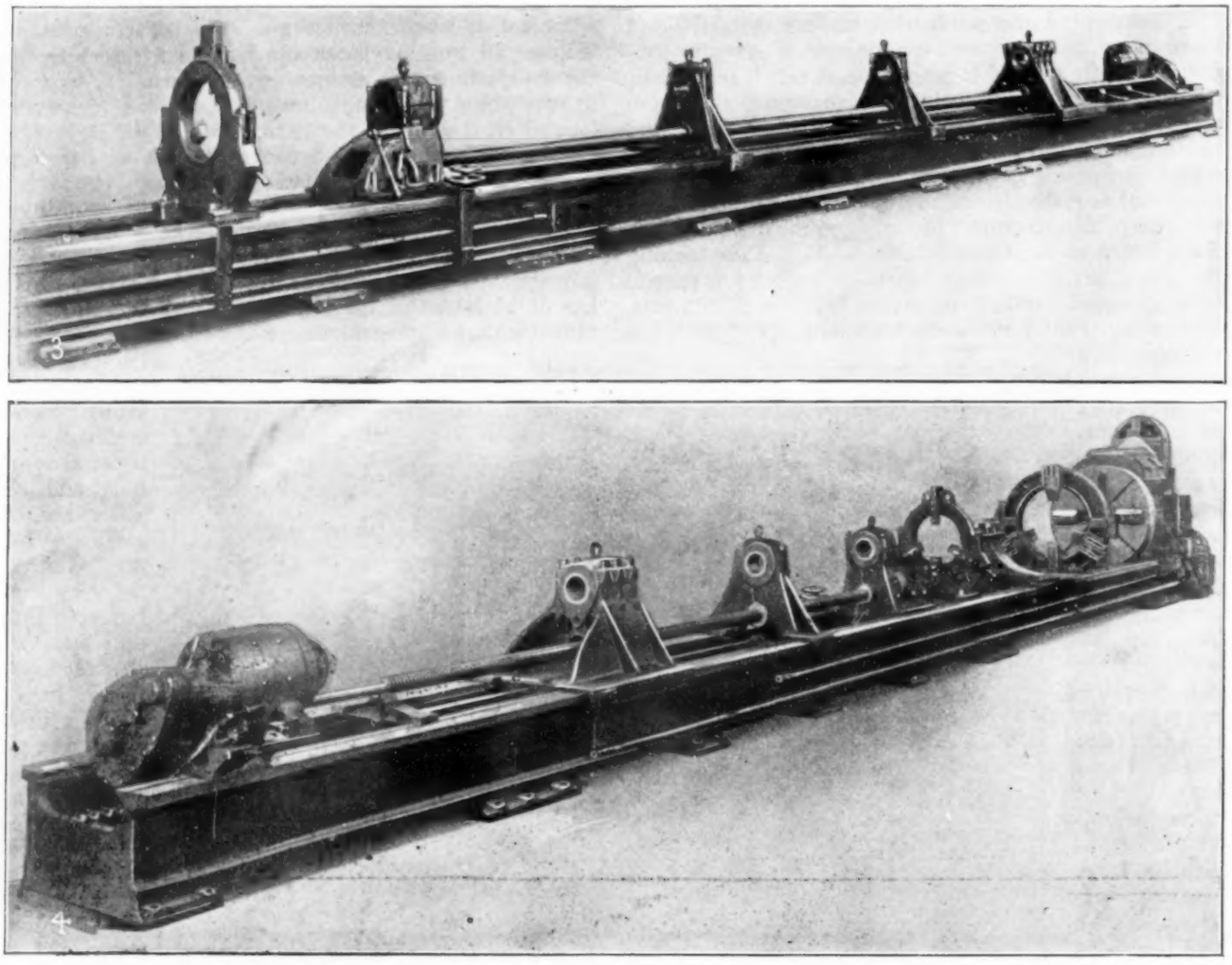
The Boring Unit

The Stamets boring-bar unit, used instead of a boring bench, consists of four or more bearings for supporting and guiding the bar and screw, the one nearest the boring tool is known as the fixed bar support. The rear bearing is called the tailstock and the others, intermediate bar supports. From Fig. 1 it can be noted that all of these bearings are connected together by a telescoping arrangement that automatically spaces the supports along the bar. As the supports are closed up by the boring operation, the feed screw is supported at regular intervals by bearings which follow up as the supports move forward; these can be seen in Figs. 3 and 4, resting on the ways, near the tailstock.

The feed screw, as plainly seen in Fig. 1, is above the ways and close to the pressure line of the boring tool. It is driven by means of a splined shaft running along the bed between the ways, and on which is slidably mounted a pinion arranged to mesh with the gear that is attached to the feed screw. The splined shaft is driven by means of gearing from the main spindle, it being important that the feed be a function of the revolving spindle. The feed screw is provided with ball-thrust bearings and has a provision for hand feed, a handle being located on the fixed bar support, enabling the operator to work up to a shoulder. The location of the screw permits use of a full nut instead of the customary half nut that is necessary when the screw is placed along the bed.

Quick-Traverse Motor

The motor at the outer end of lathe is for quick-travel purposes only, and not for feeding the boring tool. It is used to cause a quick return of the boring tool to starting position, a feature that can be readily appreciated when it is considered that a matter of weeks is sometimes required to complete the bore. The motor is also used to adjust the boring-bar unit for short gun forgings, as the feed can be disconnected from the spindle by means of a sliding gear that is located in the fixed bar support, and the screw, boring bar and all of the bar supports may be moved forward by the motor, as it is geared to the screw. To adjust the boring-bar unit for a short gun forging use the lever on the fixed bar support to throw the feed gear out of mesh, then start the quick return motor. When



FIGS. 3 AND 4. BORING-BAR UNIT AND QUICK-TRAVERSE MOTOR

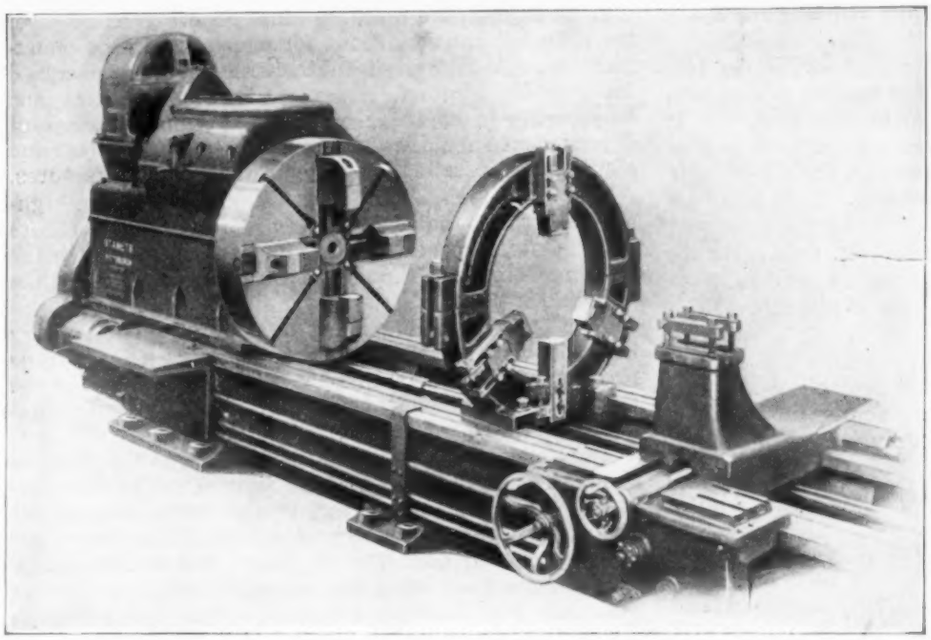


FIG. 2. STEADYREST WITH AMPLE BEARING SURFACES

the tailstock has moved forward to the desired position, stop the motor and fasten the tailstock to the bed. Then release the bolts and pawls holding the fixed bar support and motor support to the bed, reverse the motor and the screw will move forward carrying with it the motor and all of the bar supports. Power is supplied to the traveling motor by means of a flexible cable that is supported in brackets at the back of the lathe.

As the boring operation of a big gun requires a positive continuous flow of cutting lubricant a complete circulating system for this purpose has been provided. A motor-driven pump and storage tank are located beneath the floor; these are connected to a series of receptacles placed inside the bed of the lathe. The cutting compound is carried to the boring tool under pressure by means of telescopic tubing. The handwheel controllers for both headstock and quick-traverse motors, being attached to the fixed bar support, see Fig. 1, are always conveniently located near the operator's position at the mouth of the forging. The machine, as shown in the headpiece, is 100 ft. in length and weighs 1700 lb. per foot. The drive motor for this lathe is 35 hp.; quick-traverse motor, 10 hp.; circulating pump motor, 5 hp. Other approximate specifications of the lathe are: Swing, 55 in.; width, 8 ft.; height, 9 ft.; approximate weight (100-ft. bed), 85 tons; extra weight per foot of bed, 1500 pounds.

Making an Accurate Sine Bar

By Hugo F. Pusep

From the various articles appearing in the *American Machinist* from time to time on the subject of easily made sine bars, it is evident that the writers have encountered difficulties in constructing a sine bar of the standard design.

This has naturally led to various modifications in the homemade sine bar, some of which, while quite ingenious, lack the absolute dependability of that of the conventional type.

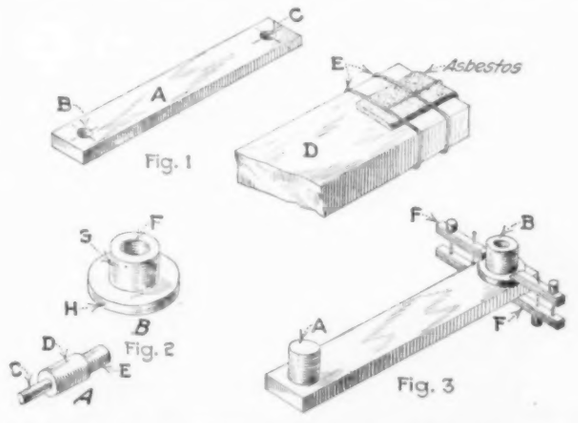
We are all agreed that a sine bar, with two setting plugs or buttons pressed into holes at the ends and spaced some standard distance apart, is the most dependable one for all purposes. Such a tool, if properly made, will last indefinitely and there is no possibility of the setting plugs ever moving, because they form in conjunction with the bar proper a practically solid tool.

The difficulty of spacing the holes for setting plugs accurately as regards center distance is apparently the reason for so many "fancy" sine bars.

The usual way of constructing a sine bar with pressed-in buttons or plugs is to rough out the plug holes, then harden the bar and lap one of the holes to size; the remaining hole is then plugged and a button set on the correct location of this hole. The sine bar is now clamped to the faceplate of the lathe and the button indicated to run true, after which the button is removed, the soft plug bored out and the hole ground to finish size. By this method close work can be produced, provided that the conditions are perfect and the time of doing the job is no object. The lathe on which the grinding is done must be in first-class condition and the faceplate should run in perfect balance; otherwise an error of two or three tenths will easily creep in.

Under general conditions, however, the average toolmaker in making a sine bar for his own personal use would have to do the job in his spare moments, keeping his eye constantly open for the "boss," and therefore the above method for him would be out of the question altogether.

The following gives a few pointers as an easy method of making a standard sine bar. This method has



FIGS. 1 TO 3. STAGES OF MAKING THE SINE BAR.
Fig. 1—The bar and the holes. Fig. 2—The setting plug and bushing. Fig. 3—Ready for reaming the second hole.

several advantages, one of these being the elimination of the grinding operation for holes. Another feature which should appeal to the average mechanic, is that all individual operations in constructing the sine bar are of short duration, enabling him to lay it aside or

resume work on it at any time, thus utilizing his spare time in the shop.

A good grade of oil-hardening non-shrinkable tool steel is the best material to use for making a sine bar. After machining the bar of steel all over as at *A*, Fig. 1, the locations of holes *B* and *C* are laid out. It is best to make these holes a standard size and for a 5-in. sine bar the holes could be $\frac{3}{4}$ in. in diameter. Hole *B* is now drilled and reamed with a slightly undersized reamer, and the hole *C* is drilled with an $\frac{11}{32}$-in. drill. Before hardening the bar, the hole *C* is filled up with asbestos cement and a piece of sheet asbestos is placed over the end of the bar as shown at *D*, Fig. 1. This asbestos sheet is secured by wires *E*, and overlaps the end, as clearly shown on the sketch. This protecting asbestos prevents the quenching oil from coming into contact with the hole, and consequently leaves it soft enough for reaming. The sides of the bar are ground and lapped parallel after hardening, and the hole *B*, Fig. 1, is also lapped to finish size.

At *A*, Fig. 2, is shown the form of setting plug or button for this type of sine bar. Two such plugs are required, which are made of drill rod, hardened and ground. The shank *C* is left on for the purpose of holding it in the lathe collet while grinding the diameters *D* and *E*. Both of these diameters are ground at the same setting in order to make them perfectly concentric. The diameter *E* is ground to a light press fit for the holes in the sine bar, while the diameter *D* is made some convenient size and must be exactly alike on both plugs if the sine bar is to function properly.

The reamer bushing *B*, Fig. 2, is made of hardened tool steel with the hole *F* lapped a good sliding fit for a $\frac{3}{4}$-in. machine reamer. The diameter *G* is ground concentric with the hole *F*, and at the same setting the base *H* is ground flat and square with the hole *F*.

One of the setting plugs is now pressed into the lapped hole *B*, Fig. 1, of the sine bar; the reamer bushing is set over the $\frac{11}{32}$-in. hole *C* and secured by clamps. The accuracy of the center distances of plugs in the sine bar will now depend entirely on the measuring equipment used for locating the bushing. Measuring over the pressed-in plug *A*, Fig. 3, and the ground part of the bushing *B* with the right combination of precision gage blocks equipped with jaws and held in the regular holder, will be the best method to employ. The reamer bushing is adjusted by light rapping till the right feel has been attained; then the clamps *F* are tightened and the hole is ready for reaming, in which slow speed with plenty of lubricant should be used. After the hole has been reamed, the other setting plug is pressed in and the sine bar finished by grinding the edges equidistant from center line of plugs.

What Is a High-Grade Machine?

By H. H. Edge
General Works Manager, Locomobile Co. of America, Bridgeport, Conn.

In your editorial on "What Is a High-Grade Machine?" you have covered the subject very well. We are manufacturers of high-grade automobiles and it is generally understood by us that a machine, to be high grade, whether it is an automobile, a machine tool, or a special machine, must have properly incorporated in its production the three important features; that is, design, material and workmanship.

1. A high-grade machine must be designed to meet the purposes and conditions for which it is to be manufactured. A high-grade automobile must be designed for service, comfort, have easy riding qualities and be pleasing in appearance. The experimental stage of development should include thorough tests to detect and eliminate all possible weaknesses or unreliable features.

2. The materials used in the manufacture of a high-grade machine must be carefully selected for all its components, in order to meet the purpose for which the machine is manufactured, as a machine is no better than its weakest part.

3. The workmanship must be of high quality. Very little hand fitting should be necessary on a high-grade product, if modern machinery is skillfully used for the production of component parts, in accordance with carefully specified manufacturing tolerances.

The system of inspection of materials for the machine should be very rigid and under full control of the management, as any failure due to the material used not being of the proper quality might result seriously and offset the good qualities of design and workmanship.

When we speak of a high-grade machine we do not refer to a high-priced machine, as a rule; but rather to a machine of medium or higher price. The high-priced machines are not always high grade. Price does not make quality, but quality is not generally found in so-called low-priced machines. Many automobiles are built to sell at a price. Most of these machines give fairly good service for a season, but on account of their design and the material used, they become noisy and less reliable after the first year's service.

A high-grade automobile is largely a matter of comparison, and the same applies to other classes of machinery. An automobile that is not now considered in the high-grade class would have been considered a high-grade vehicle before the industry was so well developed. This is largely due to improvements in design or material. The workmanship is probably as good in some machines made years ago as that of today, but the methods of production have been improved, which has to some extent offset increases in costs of labor and material.

A high-grade machine is one that instills confidence on account of performance or services rendered. The essential feature of a high-grade machine is to have no inherent weaknesses that will affect its dependability for the service for which it is intended.

Why Some Replies to Ads Are Ignored

By George Fairplay

Mr. Dixie's article on page 735 of *American Machinist* regarding replies to advertisements is very interesting and brings to mind another phase of the question in which lack of knowledge of common business methods cannot be the cause. I refer to the custom of some manufacturers who advertise for work under some symbol or assumed name and address, and who, after receiving an open and business-like reply properly signed, will acknowledge the same on a blank sheet of paper and still keep their identity hidden.

This may seem like business acumen to thus get the advantage of the other fellow, but to a man up a tree it seems more like sharp practice and naturally leads to the conclusion that the advertiser is ashamed of what he is doing and is a good person to let alone.

Mr. Dixie's opinion of this practice expressed in his usual direct manner would be quite interesting.

Press Tools For a Toothed Cam

By FRANK A. STANLEY

The shaving of an unusual form of blank, requiring the accurate finishing of two or three different surfaces, external and internal, involves at times the application of several distinctive shaving operations in as many separate dies. It is a problem of this character that is taken care of by means of the tools in accompanying illustrations.

THE illustrations, Figs. 1, 2 and 3, represent three sets of press tools, for blanking, piercing, and shaving the piece shown in Fig. 4, which is one of nine similar members used in a Marchant calculating machine and constituting as a group what is known as a setting drum.

The nine drum disks are all made to the dimensions given for outer diameter, diameter of center hole, size of teeth inside and out, and length and width of the cam slot. The angular relation, however, of the latter slot in respect to the groups of teeth and the projecting lug at one side varies throughout the set of disks; for the cam slot in each is utilized to operate an individual controlling key which is adjusted radially through the necessary distance by the cam slot which acts upon the head of the key. The position of the rise in the cam slot is therefore of importance and its variation throughout the series of nine disks has led to the design of a group of press tools of unusual interest.

FIG. 1. BLANKING AND EXTERNAL SHAVING TOOLS

The disks are of german silver 0.050 in. thick and are blanked from stock $2\frac{3}{8}$ in. wide. The blanks for the series are all alike externally so one set of blanking tools answers for all of them.

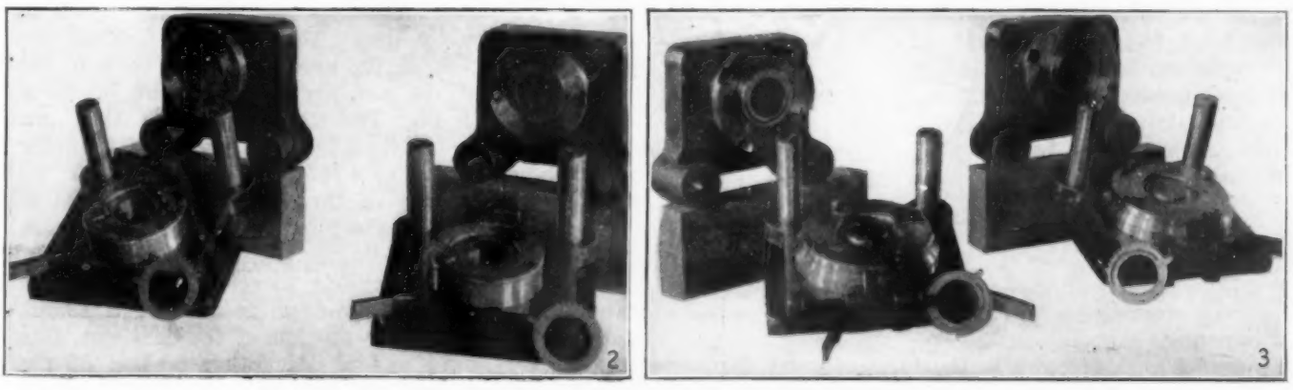
The blanking operation is followed by an external shaving cut which finishes the outside contour completely. Then the shaved blank is passed through a set of piercing dies which form the hole at the center and the internal teeth. This operation is followed by the shaving of the center opening and the inner teeth, and then the cam slot is pierced and in another set of dies the slot is shaved.

Up to the point where the slot is to be pierced, the disks are all uniform, involving no complications in the construction of the dies. But, for the operations in connection with the slots, special forms of nesting devices are required in order to give each slot the individual position necessary for that particular disk. That is, there are nine distinct positions for the slots in the different disks, and this variation is secured by an adjustable nesting plate which enables one set of tools to pierce all slots correctly and another set to shave them accurately, thus avoiding the necessity of nine separate sets of tools each for piercing and shaving.

The blanking tools for the disk are shown to the right in Fig. 1 and require no special description. It will be noticed that the trigger form of stop is used for the stock, and the dies are so laid out as to bring the projecting lug of the blank at an angle of about 30 deg. with the cross center line to permit the use of a minimum width of stock. The punch resembles one for an interrupted tooth wheel and the portion for blanking out the lug is dovetailed into the edge of the body of the punch. Three screws and three dowels locate and secure the punch to its holder, which, as will be seen, forms with the die base a set of pillar tools.

The shaving tools at the left in Fig. 1 are provided with a locating nesting plate shaped along similar lines to the one described in connection with Fig. 4, although the proportions are somewhat different to correspond with the larger size of blank to be shaved. The stock is 0.050 in. thick, the amount removed on a side by shaving is 0.005 in.

The tools at the right in Fig. 2 pierce the center



FIGS. 2 AND 3. TOOLS FOR PIERCING AND SHAVING THE CENTER HOLE AND INTERNAL TEETH, AND CAM-SLOT TOOLS

opening and form the internal teeth, and the ones at the left in the same view accomplish the internal shaving operation required for finishing the inside contour.

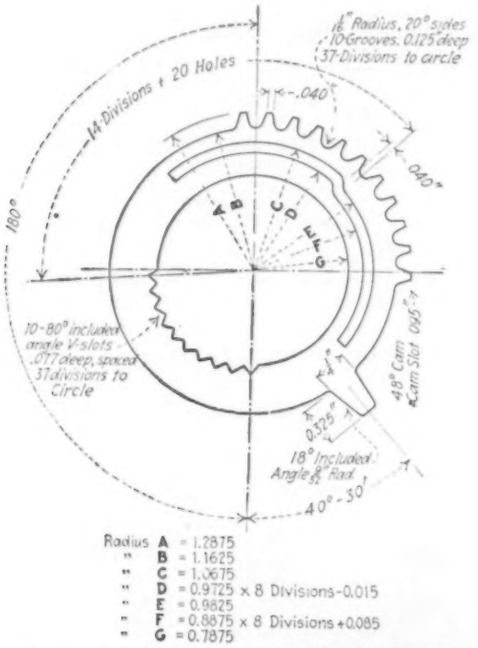


FIG. 4. LAYOUT OF A SERIES OF CAMS

The nesting of the blank is accomplished in the same manner for both sets of tools and the sketch, Fig. 5, will give a good idea of the general arrangement of their various parts. While the latter view is more specifically related to the shaving tools, it represents as well the essential features of the tools for the piercing operation. The form of the nesting plate is a close outline of the blank and its depth of $\frac{1}{4}$ in. is relieved around the opening by a liberal chamfer which removes the corner for one-half of the thickness. The punch is provided with a combined pressure plate and stripper which serves to hold the work flat and which strips the punch upon the upstroke of the slide. Both dies for the piercing and shaving cuts are provided with ejectors in the form of vertical pins *A* which are operated by downward pressure upon the end of the handle *B*.

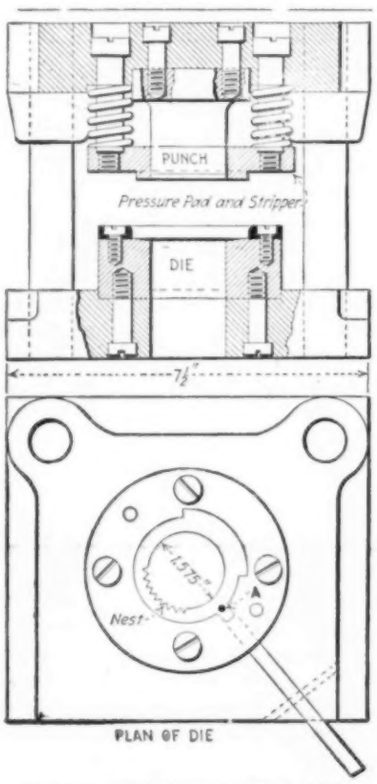


FIG. 5. SHAVING TOOLS AND NESTING PLATE

Referring to Fig. 3, we find here some interesting features in construction. These tools pierce and shave the cam-shaped opening, and as they are alike in the main, the description may well be confined to the shaving tool details which are clearly brought out by the drawing, Fig. 6, and by the halftones, Figs. 7 and 8. These show the principle parts as they appear when the tools are taken apart. They are made up of two parts each ground to the correct relationship to one another.

Referring to Figs. 6, 7, and 8 where the same reference letters are used, *A* is the main portion of the die which is pressed into a steel ring *B*, by which it is secured to the die shoe. This die *A* is finished out to a radius of 0.9825 in. except for the portion for the high part of the cam slot which is cut out to a radius of 1.0675 in. The greater part of the bore may therefore be finished by grinding to a diameter equal to twice the radius 0.9875 or 1.9750 in.

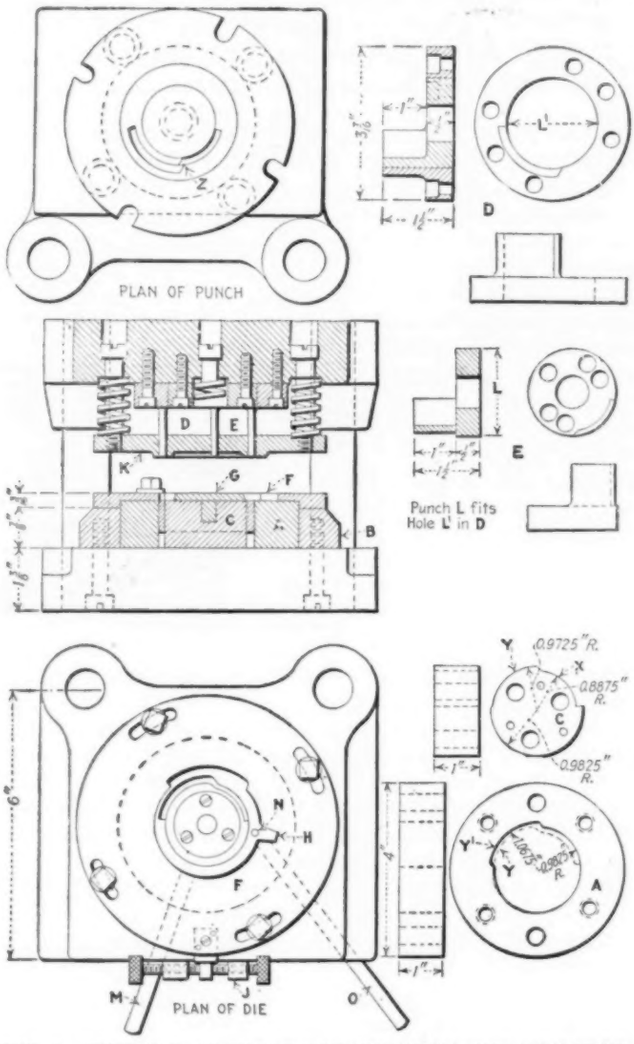


FIG. 6. DETAILS OF TOOLS FOR SHAVING THE CAM SLOT

The smaller section of the die proper shown at *C* is ground for the greater part of its circumference to a diameter corresponding to the interior of the main die *A* and made to fit closely therein. A part of the circumference of *C* is, however, reduced to a radius of 0.8875 in. for the low portion of the cam slot, this being shown at *X*; and at *Y* another portion of the outside surface is reduced to a radius of 0.9725 in. to give the proper width of gap between that portion and the corresponding edge *Y* of the main die *A*.

These figures may be checked up with the radii given on the drawing of the work in Fig. 4 and will give a clear idea of the manner in which the proper width of slot is provided for between the opposing faces of the two die members described. The position of the holes for the screws and dowels for securing the die parts to the base or shoe will be seen in the drawing, Fig. 6, and also in the group of halftones.

Similarly, the punch is constructed with two parts, outer and inner, which facilitates the making of these members. The larger punch part *D*, Fig. 6, is made with a piercing projection of long enough arc to cover the high portion of the cam slot, while the inner member *E* is constructed to pierce the low portion of the slot.

The base of punch *E* is finished to fit closely in the opening through the bottom of punch *D*, and the two members when put together overlap at the cutting ends as at *Z* to give a smooth continuous cut through the slot at the point where high and low cam slots meet. The edges of both punch parts are beveled at the necessary angle to give the correct slope to the cam-slot rise. The cutting portions of both punch members are ground after hardening to give the required inside and outside radii.

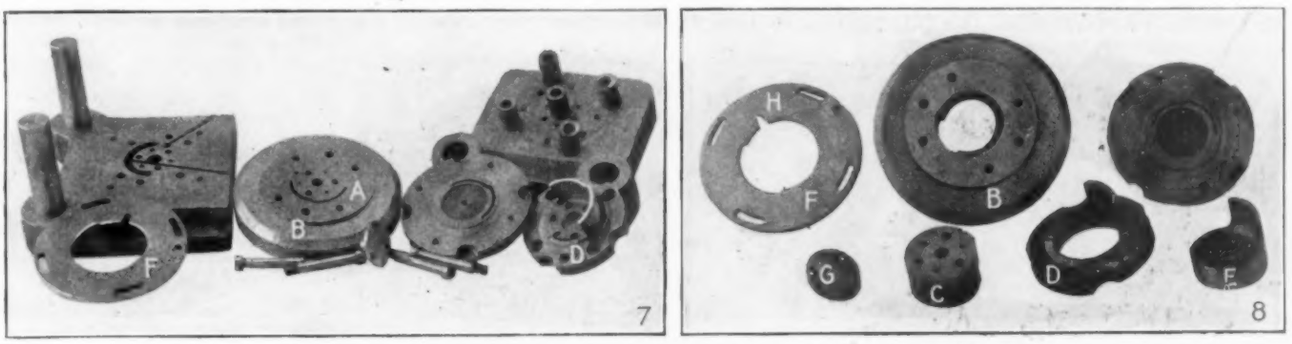
The work to be shaved is placed in the adjustable nesting plate *F* where it fits with its center located over the thin pilot disk *G*, and with its projecting lug in the notch *H*. The latter gives all the pieces to be shaved a definite position and it remains only to adjust the nesting plate upon the die to secure any desired location around the circle for the cam slots. This adjustment is secured as follows: The plate is seated by a recess in its underside which fits over the top of the die *A*. It is adapted to be clamped in position by four screws passed through the curved slots near the edge. At the front is secured a short arm which is engaged by the opposing thumb screws *J* for adjustment either to right or left. Thus, while the punch and die remain in fixed position, the nesting plate and the work may be set around to a master for locating the slot according to the requirements for that particular job. After one lot has been run through the tools, the nesting plate is reset for the next number in the series of cam disks and so on with the entire lot.

The punch holder is fitted with a spring-actuated pressure pad and stripper *K* backed by five springs, one being located at the center where it passes up through the sectional punch into contact with the back of the stripper. There is a knock-out in the die slot, actuated by the handle *M*, for ejecting chips, and a pin knock-out at *N* operated by handle *O* for lifting the finished work from the die.

Cutting a Screw to Accurately Fit a Tapped Hole

By E. A. Dixie

Some four months or so ago we built a straightening press of the common screw type. The screw was eight threads, 2½-in. diameter. The nut was tapped with an ordinary commercial tap and the screw cut from 60-point carbon stock on an engine lathe. The lathe hand used ordinary care and when fitted, the screw seemed to be a pretty snug fit for the threaded hole. In use, however, trouble developed almost at once, the thread in the nut broke off, a porton of a thread at a time, and in a few days the final threads gave way and the nut was entirely stripped.



FIGS. 7 AND 8. PARTS OF TOOLS FOR SHAVING THE CAM SLOT

The head of the press was then bored, a bushing fitted and tapped with the same tap. When completed and put in service our previous experience was repeated and before very long the press was again completely out of commission.

About this time my attention was called to the trouble and a solution was asked. My first job was to measure the lead of the tap. On comparing it with a standard steel scale I could not find that it varied enough to be measured by that method. The threaded part of the tap was apparently within a very few thousandths of what it should be. The threaded hole in the press was, however, about two and a half times the length of the straight part of the thread on the tap so the next job was to bore and tap a piece of cast iron of similar length. After tapping, this piece was cut in half lengthwise and the thread measured. In the long piece the difference from normal of the threaded length was very apparent, the nut being considerably longer in a given number of threads than the screw, cut on the lathe to the same nominal pitch. This discovery furnished the reason for the failure of the nut in the straightening press.

The screw took a bearing at the ends only of the nut, therefore, as it was forced down on the work to be straightened, the bottom thread of the nut took the entire stress applied and because the screw was steel and the nut cast iron the first thread in the nut failed. In turn, the second thread of the nut had to take the entire stress and so on until the entire nut was stripped.

Theoretically, the nut should be shorter in a given number of turns than the screw by an amount sufficient to compensate for the amount the stock of the screw is compressed under working conditions. As there is, so far as I know, no way of ascertaining this and no way of causing the elasticity of the metal to remain constant we decided to make the screw "just a trifle" longer than the nut and let it go at that.

The change gears of one of our lathes are the same pitch, face and hole as the gears of one of our gear cutters, so it was not a difficult matter to find a set of change gears that would cut a thread a little longer in lead than the one we wanted (the exact thread we were after was not obtainable by means of gearing alone).

The stock was gotten out for a new screw and placed between centers and turned. The tail spindle of the lathe was then set over slightly *by guess;* not by calculation as there are so many variables for which no provision can be made in any formula. Among these are the variation of the lead screw from nominal lead, and variation from parallelism of the lead screw axis and the lathe axis. These, of course, vary with the lathe and, in the case of lead, vary with the section of the screw engaging the nut.

The taper attachment was then set to compensate for the amount of set-over of the tail spindle so that the screw would be of uniform diameter throughout its length.

A trial cut was run over the turned screw blank, the blank removed from the lathe and measured by means of a vernier with 60-deg. points clamped to the jaws. The positions of these points relative to the jaws are of no consequence so long as their apexes are equidistant from the beam of the vernier and their bases parallel with the beam. Several readings were taken of the trial thread on the screw and averaged, and a similar number of readings were taken of the nut, the measurer being of course careful to make his measurements parallel to their axes. The set-overs of the tailstock and taper attachment were then increased or decreased (as the case might be) again by guess, to cause the thread on the screw to more nearly approximate that in the nut. Another trial cut was then taken to clean up the thread to the *new* lead and again the thread was compared with that of the nut. This time and subsequently, measurements of the screw thread only were necessary as the original measurements of the nut were assumed to be satisfactory. After several adjustments of the tailstock and the taper attachment, a thread was cut on the screw which was longer than that in the nut by about 0.003 in. in 3 inches.

We assumed that this was about as close as we could hope to get it, so the thread was finished to full depth at this setting.

A new bushing had been made and tapped and the thread was fitted to this. The press has now been in use for three months and so far there have been no signs of failure of the nut; it is reasonable to assume that the screw and nut match each other so closely that the stresses are borne almost uniformly by all the threads of the nut, the elasticity of the steel and cast iron compensating for any slight variation in length between the screw and the nut

A Puller for Pinions

By J. B. Hamilton

The pinions of motors used in electric-railway work are subjected to very heavy duty; they must therefore be put on their shafts as nearly solid as separate pieces of metal can be.

Owing to their exposed positions in all kinds of weather they rust in place and are very difficult to remove. Ordinary straps and clamps are of no use for removing them and to avoid extra expense the shafts must be as little damaged as possible. With this object in view, the pinion puller shown in the illustrations was designed by the General Electric Co. for use in its own works. It has since been copied by others and can be found in many shops where such work is done.

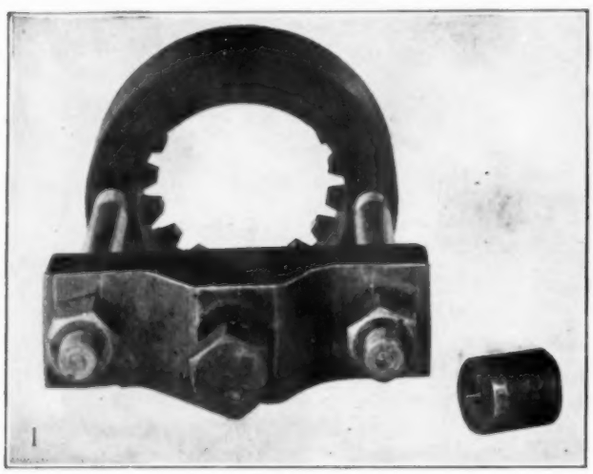


FIG. 1. THE PINION PULLER

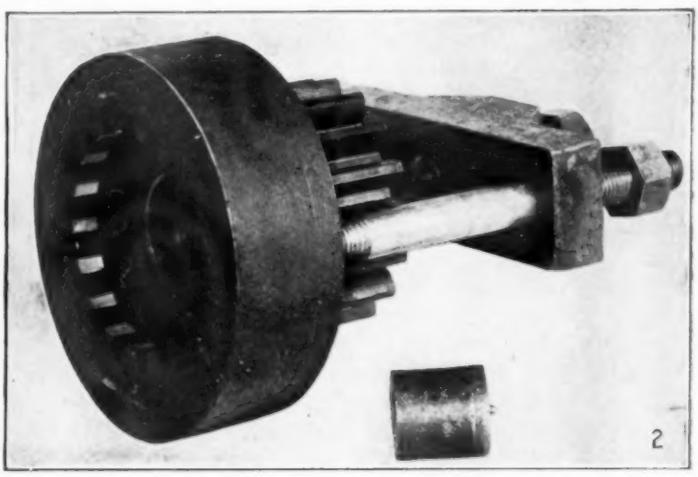


FIG. 2. PINION PULLER WITH PINION IN PLACE

The internal-ring gear is cut large so that, no matter what may be the condition of the teeth of the pinion, the ring can be slipped over it, given a turn of about half a tooth to bring its teeth in contact with the faces of those of the pinion, and tightened.

To avoid injuring the end of the pinion shaft, the small cylindrical piece, shown in the foreground, is used. At one end this piece has a male center, to center it on the end of the motor shaft, this center is surrounded by a piece of hard brass about ¼ in. thick. The other end of the piece has a female center to take the end of the hardened-steel, cone-pointed pulling screw.

The studs at the sides are made of nickel steel. They are made in various lengths to suit various lengths of shafts and are used interchangeably in the same yoke and puller ring.

The rings are also made in various sizes and with various numbers of teeth.

Fig. 1 shows the puller alone and Fig. 2 shows it in the position it occupies with relation to the pinion it is pulling. For clearness the shaft is omitted.

Industrial and Labor Conditions Abroad

By LUTHER D. BURLINGAME
Industrial Superintendent, the Brown & Sharpe Co.

A recent trip abroad as a member of the National Screw Thread Commission gave the author an exceptional opportunity to study labor and industrial conditions in England and France, both by observation and by meeting and discussing the situation with men in all walks of life. Views based on the experiences of this trip are given with the thought that they may serve as a guide and warning to both employers and workmen engaged in American industries. The illustrations used are given as "straws showing which way the wind blows," rather than as definite proofs of the conclusions reached.

THE facts most strongly impressed on the visitor are the vast amount of work needing to be done, the shortage of help to do it, while at the same time great numbers are out of employment; and there is deep-seated unrest, coupled with a general lack of knowledge and understanding of the principles underlying industrial progress—principles on which prosperity and the stability of society rest. Such a condition leads to a feeling of apprehension and even alarm as to what the future may hold in store.

There is an evident widespread desire to hold back on production, to avoid work, and to look for "the easy job." One gets the impression that half of England is on "holiday" and half of France at leisure in the cafés.

A realization on the part of those in authority in both countries of the danger of such conditions is shown by most urgent appeals to increase production, to cultivate thrift, and to turn a deaf ear to revolutionary doctrines; the methods used being by speeches and proclamations on the part of leaders, appeals through the press, and the distribution of circulars and cartoon posters, the latter being especially in evidence cn the walls of Paris.

King George, in his recent Guildhall speech, gave a stirring call to the British people to get to work, this being the keynote of his address. He said:

"Our country urgently demands from every citzen the utmost economy and strenuous and unremitting industry, to insure the greatest possible production of necessary commodities.

"Without these we shall have to face depression and poverty."

As far as could be seen, very little response was being made to such appeals, the common excuse of both executives and workmen being:

"We have worked hard and without let-up for five years, and now that the war is over, we feel like easing off; and, as the danger is past, we do not see the need of exerting ourselves."

This has led to a situation which may prove more critical than the war itself because it is undermining the very foundations of industrial life; and, while it is believed that this period will soon pass and that the good sense of the vast majority of the people in both England and France will hold for stable conditions, it opens the way for revolutionary and extremist ideas to creep in and possibly get control.

This apathy, together with the struggle for shorter hours, for decreased production, the tendency to dependence on government pensions, and to spend what had been saved during the rush of war work before earning more, increases the scarcity of goods and produces higher and higher prices, artificially defeating the law of trade where high prices should normally produce a surplus of goods and thus bring down prices.

That one line of industry is dependent on another is clearly shown by some of the experiences of British manufacturers, where, on account of coal shortage, due to strikes and the uncertainty of transportation, many lines of manufacture have been obliged to shut down for lack of fuel, throwing large numbers out of employment, who would otherwise be willing to work, and creating uncertainty as to the future in the minds of others.

One great industry, which had been vital to Britain during the war, and the management of which is earnestly struggling to shift onto a peace basis, while maintaining profitable production, stated they could keep running not more than another week unless there was a change in the fuel situation, even though they had priority on deliveries of coal.

There is a serious shortage of locomotives and freight cars in Great Britain, due to the wastage of war, and efforts to overcome this shortage by increased production while being made are in danger of being thwarted because of the failure of the supply of raw material. This is also jeopardizing the employment of large numbers of workmen.

This situation also appears to be acute in Germany, as a newspaper item says that "six of the largest electrical plants in Germany and many of the smaller industries will shut down, due to the coal shortage."

It is reported from France that the soap makers of Marseilles have decided to close their factories because, although there is a shortage of soap, the demand being great even though the price is high, they find transportation of their goods impossible.

In other cases in England, the production of the raw material, such as iron and steel, is so uncertain, that while a progressive program of enlarged production is looked forward to and desired, manufacturers are already alarmed over the shortage of such raw material and unless a remedy can soon be found, must, instead of enlarging, curtail, or shut down, even though crowded with orders.

In one day in London our party felt the effects of four kinds of strikes which were in progress. We were without bread because the bakers were on strike. The streets in the Kensington district, where our hotel was located, were full of rubbish because of the street cleaners' strike. We had to travel far out of our way because of a strike on one of the underground railways. A strike of the police while, fortunately, not effective to any great extent in London, occurred on the night members of our commission lost many personal belongings through a robbery of our hotel rooms, so that the situation was brought closely home to us by personal experience as well as observation.

Public smoking and drinking among women in England having developed to a surprising extent

These strikes were for shorter hours, higher pay, holiday privileges, etc.; all in the line of further tending to reduce production, increase taxes and add to the cost of living. This spirit of strikes and of unrest was being stirred to the limit by revolutionary workers and speakers, who were given a surprisingly free opportunity for public speech, at least in London and the industrial sections of England, and I understand also in Brest and other French cities.

Government Openly and Violently Denounced

In London I heard a speaker in Hyde Park, on the International Direct Action platform, openly and violently denounce the government—in fact, all governments, except that of the Soviet—proclaiming Bolshevism as the great panacea for mankind, and making the statement:

"The time is soon coming when if I need something to eat I will take it. If I need clothing I will help myself to what I need. If I need a home for my wife and my kiddies I will take it from those who have got it."

When this speaker was finally removed by the police for making still stronger statements, other speakers denounced the police in most bitter terms, and evidently had the sympathy of a great crowd, representing persons in many walks of life. One of the most disquieting features of the situation was that educated men and those in executive positions, and who should be leaders in steadying the situation, showed such great sympathy with the revolutionary movement. One gentleman, whom I met casually in a restaurant and with whom I discussed the labor situation, showed by the card he handed me that he was an active executive in a large industry which had connections all over England. This man denounced the government because of the allowing of profiteering, citing as an illustration the fact that the adding of a tax on matches had been made the excuse for increasing the price far beyond the increased tax value, and intimating that he considered revolution the only remedy for clearing up the situation.

Another tirade against profiteering was delivered by a man who was ready to start a revolution because the barbers, who had previously charged fourpence for a haircut, were now charging sixpence—an illustration the force of which was lost on American ears.

In one large establishment where many thousands of women had been employed during the war, earning large pay, the manager was asked what had become of those women; whether they had entered other industries? He said that, to the best of his knowledge, they had not but were spending the money they had saved, and would not work again until that was spent. Asked about the shortage of help for house work, laundry work, etc., he said those girls would not willingly go back to such work, and that if they did it would be under quite different conditions, with shorter hours than had previously prevailed. He said, speaking generally of labor conditions, that only starving and freezing would bring workmen to their senses.

The drink situation is another serious menace to British industry, and one of the most pronounced causes of reduced production. Many inducements are held out by manufacturers to get employees to go to work on Monday morning, but the larger income and the general spirit of unrest serve to increase the patronage at the public houses at an alarming rate. In spite of all efforts, an increasing number of workmen do not show up until far into the week, while their value as workers is permanently reduced, due to the abuse of drink. This applies to both men and women workers, public smoking and drinking among women in England having developed to a surprising extent during the last few years.

Among the out-of-works, the ex-soldiers and others who have been in government service during the war are prominent, due partly if not largely to the fact that an out-of-work pension is paid until they secure employment. It is understood this will soon be discontinued because the privilege is so generally abused.

Another difficulty is that because of so many industries having been controlled by the government and because the government pays, it is thought by the workers that the rate of wages can be increased indefinitely, and that no particular attention need be paid to the cost of operation. An opportunity in such cases is presented for political pressure to be brought to bear, so that these industries are kept constantly unsettled,

and others are also unsettled, due to the inequalities thus created.

An editorial in a London paper, pointing out the importance of education in dealing with the alarming conditions, states that a teacher, although having spent four years in training which brought no remuneration, now receives one pound less per week than a policeman; and yet there is agitation going on of a dangerous character to still further increase the pay of the police.

While in the main labor-union interests have not taken up with the extreme revolutionary movement, and in some cases have proved a bulwark against it, still they have in other cases been used as tools of that movement, and practically all strikes play into the hands of the revolutionists.

The Engineer, of London, in the issue of Aug. 1, 1919, in an editorial headed, "Labor Tyranny," points out how, in France, labor interests in general had been working through such organizations as the "Confédération Général du Travail." Although this organization was of a revolutionary type and having a bad record, the excuse was that, although they were not fully in sympathy with its methods, it gave them the benefit of an organization already effectively in operation, through which they might quickly attain their ends.

There is also a marked tendency in England for parents, even when able bodied, to look to their children for aid in their support, easing off and becoming non-producers.

Among all the varying and conflicting labor organizations and representatives of labor interests, not one was found making its main purpose the increasing of production and the cultivation of thrift. On the other hand, there were many evidences of a policy aiming toward exactly opposite results.

In commenting on Lloyd George's forceful appeal to the British people to increase production, the *London Daily Mail* of Aug. 20 said editorially:

"It is a disastrous fallacy that by doing less work more employment is provided.

"The roots of the causes of under-producton are three:

"In present conditions neither worker nor employer in many instances benefits by increasing output.

"The manufacturer cannot launch out because he does not know what the government's trade policy in all its details is, or what fiscal conditions he will have to face, and because he cannot foresee the cost of his raw material or of his labor.

"When the government pays immense sums to people as doles for doing nothing, all motive for work in many instances is removed."

In an attempt to analyze the difference in spirit between American and European workers, it is thought that a tendency is seen, especially among British workers, to hold each other to a common level recognizing class distinction, and to shame those who try to rise above it by efforts of thrift or better living—a spirit of spending for the gratification of the moment rather than with a thought of the future, or of an ambition for the advancement of the family. This type of British workman is not willing to sacrifice through a period of years to secure a home, or capital for some enterprise of his own, or even to own his own automobile; but instead, is looking for an extended number of holidays and shorter hours of work to secure time in which to spend what he earns. There is also the marked tendency in England for parents, even when able-bodied, to look to their children to aid in their support, easing off and becoming non-producers themselves.

Government supervision of many details of the relations between employer and employee has led to a constant irritation and fighting cut of issues, workmen no sooner gaining one point than it makes them bold to ask for additional concessions, which makes the legitimate enlargement and extension of industry very uncertain.

An engineer and manager of large electric power interests, located in many parts of Great Britain, told me that government supervisors had classed many of his untrained laborers as skilled workers, thus automatically increasing their rate of pay to such a point that the margin of profit was more than cut off and it had been necessary for him, rather than to operate at a loss, to shut down his plants, thus disorganizing not only his own but other industries and throwing many out of employment.

Restrictions on imports of American goods into England have hampered many workers, and hindered the extension of many plants, because, due to the shortage or lack of adaptability of the domestic supply, there were no other machines or tools to take their place. The government, realizing its mistaken policy, is gradually modifying these prohibitions so that such difficulties may be reduced in the near future.

It is felt that the only hope of financing the war debts in France and England is to increase exports by developing foreign trade. This has been given much study in the latter country, and the possible advantages of adopting the metric system have been weighed in England by a royal commission. While the report has not as yet been given to the public, the consensus of opinion, also voiced by many engaged in the industries, seems to be that much more harm than good would come to industry by a change from the established system, due to the cost and confusion of making such a change. It was pointed out at the hearings that in the single item of the manufacture of textiles, which constitute one-third of British exports, the English system is now the world basis of manufacture, and that a change would be a serious detriment rather than a benefit to foreign trade, to say nothing of the burden to home manufacture.

In spite of the great number of women who have been

thrown out of employment due to retrenchments on war work, it is more difficult than ever to get work done such as women were engaged in prior to the war, and the shortage of help along such lines as housework, laundry work, hotel service, etc., is acute.

The war has permanently demonstrated that women can successfully do shop work, and the report of the committee on engineering, appointed by the British Government in 1916 to consider the state of industries after the war, states:

"On light work, involving repetition, female labor is quite as good as male labor. The continuance of a certain amount of female labor is both necessary and desirable."

In one case a manager excused himself for keeping a girl on a job previously performed by a man, even after the return of the latter from service, because she was more efficient. He had, however, found other work for the returned soldier.

There is at the present time a critical spirit in labor circles regarding the employment of women, and propaganda against it is shown by a crude notice posted at Hyde Park, reading:

"English Women Do Soldiers' Jobs.

1914—Fall in, your King and country need you!

1919—Fall out!"

Most of the women are now off of the buses and cabs, and have also left other lines of public service previously engaged in by men. There is, however, a marked shortage of accommodations in these lines of service. In London, on Sunday morning, it was impossible to find a bus running or a taxi available for hire, even in the center of the city, and the overcrowding of public vehicles during the rush hours is great. In Paris several taxi drivers were approached before one was found willing to drive up the hill to Montmartre. A bus driver in London refused a trip which would have paid well besides bringing him a liberal tip, because it was going to take him 10 min. over his scheduled hours of work.

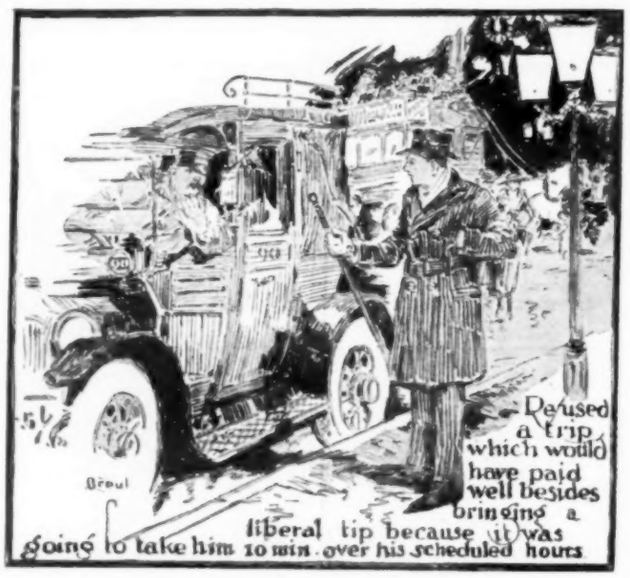
Besides the appeals from leaders, already referred to, urging increased production and thrift, many of the newspapers are carrying on a strong campaign. The "Weekly Dispatch," of Sunday, Aug. 10, in an editorial on increasing production, after speaking of the gravity of the situation, points out:

"Restriction of imports is no remedy. It is even a doubtful palliative. The only remedy is increased production. The world is clamoring for goods and we are not producing them in adequate quantity. The first duty of the government is to set free all available labor for production, and to stimulate and encourage every class and grade of labor to attain its maximum output. It is only by such effort that bankruptcy can be averted."

Organizations such as "The Peoples' League" are being formed, having the purpose of placing an organized body of taxpayers and consumers back of efforts to steady the situation and to offset unjust demands by minority groups, who by their aggressiveness threaten to control.

In France, from a merely local affair, the anti-profiteer movement has become national and the "League of Consumers of France" has been formed.

The pending abandonment of the plan of out-of-work pensions for soldiers and sailors which has been costing the British Government £100,000 per week, should be of material help in returning able-bodied men to work.


Refused a trip which would have paid well besides bringing a liberal tip because it was going to take him 10 min. over his scheduled hours

There is quite a general feeling in England that the determination of labor conditions should be in the hands of the government to a greater extent than in pre-war times.

It is probably premature to express any opinion on how far the training of disabled soldiers will fit them for work in the industries, there being as yet comparatively little indication of tangible results in this direction. Some instances noted suggest that manufacturers are not ready to go out of their way to try to help such cases.

Many British industries are taking up plans of cooperative bargaining by having elected representatives of the factory meet with officials to discuss grievances, questions of pay, hours of work, women employees, and even distribution of profits, etc. As far as can be seen, this is not being done by the management because it is believed to be an intrinsically sound business policy but as an offset to a more dangerous situation which it is feared may develop; and while it is being carried out in good faith, and with some degree of success, it is not felt to be a vital solution of the problem.

Some of these experiments are along the lines of the recommendations in the report of the Whitley committee, others looking to coöperation controlled by conferences between the management and "shop stewards."

In none of these cases was there evidence of a willingness on the part of the management to relinquish full business control, or as has been well expressed, "part with the authority of ownership." As far as could be judged, the system of shop stewards is not favored by trade unions, for one reason because it tends to divert authority and control from them. The labor-union interests in England seem to be at odds with each other on important issues, this leading to many acrimonious controversies.

While provisions for housing are far from adequate, there now seems to be an awakening to the needs, and a program of building is being inaugurated without waiting for prices to come down. The same change has come about in the machinery market, and many who have needed added equipment but have crippled themselves by waiting for lower prices are now placing urgent orders, almost without asking the price.

There has never seemed to be so great a tendency in Great Britain as at the present time to break away from conservatism, an indication being in extending the use of automatic machines and labor-saving processes and devices. Such a tendency, properly directed, is a hopeful sign, and should be of eventual benefit to British industries. There is, however, a British conservatism of habit, and it is doubted whether this will readily be changed.

To illustrate, a case was brought to my attention where an old, experienced clerk refused to have any part in a short-cut, simplified method of calculation, because, as he expressed it, "it is so simple, it would make a baby of me," and this even though he had previously been complaining about the monotonous routine of his work, which the method in question would have done away with.

It seems surprising that in France, which is the most idealistic all nations, conservatism and a holding to the past should be most strong, and the difficulty of giving up old methods for new the hardest to overcome, this applying not only to manufactures, but to agriculture and to many of the basic pursuits of the people.

Many leaders in both countries are working on the difficult problems of readjustment to new conditions; commissions have been appointed and steadying influences are at work. It is believed that the fundamental good sense and stability of the people will prevent any upheaval beyond what can be controlled, and that eventually an improved basis of industrial life will be the outcome.

The determination and grit with which Britain is facing her problems and bearing her burdens, without complaint or begging for help, is a marked feature of the present situation. In the case of France, distinction may be drawn between the French people and the French Government, the former struggling under their burden with courage and cheerfulness, even gaiety, while the latter may seem to an onlooker to strike a note of discouragement and of begging for help.

The thrift and loyalty of the French people will however prove a great anchor—a stabilizing force—which should bring renewed prosperity to the people who have borne the brunt of these years of struggle.

While the whole world is looking forward hopefully to a better industrial condition growing out of the wreck of war, such hope will end in bitter disappointment and disillusionment unless in America as well as in the great Allied nations abroad visionary and revolutionary measures are shunned, and sane and sound policies prevail.

It is true that many conditions are fundamentally different in America from those prevailing in European countries; yet the problems of those countries here discussed are broadly the same as ours. We equally need to learn the lessons of maximum production and of thrift; we need to support our Government in carrying the burden left by the war.

The extension of business enterprises and the support of the Government by the investment of savings instead of spending for pleasure that which has been saved, will not only bring further profit to us, but will put us in position to do our part to meet the world's needs, which are so pressing.

We should bear in mind that, in the last analysis, the workers are the main consumers; that whatever adds to the cost of production, either in wages or material, increases the cost of living to the workers; and that the solution is not in still higher wages but in the equalization of wages on a basis of service rendered, and increase of production, so that all may have the necessities, and to the greatest possible extent the luxuries, of life.

The Williams' Internal Gear

To the Editor:

I have read with considerable interest the article by Mr. Trautschold on page 255, *American Machinist*, and in the second paragraph I find a statement which I would be pleased to have analyzed.

Mr. Trautschold, in speaking of internal-gear, motor-truck axles, says: "And the fact that the power is delivered to the driving wheels near their periphery makes the transference of power more economical than in the case of worm-drive transmissions."

As far as the efficiency in operation of the motor-truck axle is concerned, I do not see that it makes any difference as to whether the power is applied at the hub or near the periphery of the wheel, except that in applying it near the periphery an extra set of gears is required, which, of course, would lower the efficiency.

EVERETT J. COOK.

The live axle of a motor truck (driving axle) transmits the same amount of power whether the driving axle is central with the driving wheels or offset. This is quite obviously true. But, in the case of the offset axle—the condition existing in the case of the internal gear drive—the power is delivered at a higher speed of rotation—proportional to the speed ratio of the internal gearing—compensating for the increased lineal speed of the driving wheels at the point of power application, so that very nearly the same power is delivered to the driving wheels at a point removed from the hub as is in the ordinary construction delivered at the hub of the driving wheels and thus increasing the effectiveness of the transmitted power in driving the truck. Though the driving wheels revolve no more rapidly than in the case of the central driving axle—due to the final speed reduction through the internal gearing—the transference of power is also more efficient, mechanically.

The increased effectiveness is due to the leverage secured through the internal gears—just as a hand-wheel, for instance, can be turned more effectively and with application of less power if grasped at a point removed from its hub than if grasped by the hub.

The increased efficiency in transmission is due to the relatively higher mechanical efficiency of spur to bevel gearing of the same speed ratio. The ultimate wheel speed being the same in either case, it is more efficient to secure a lower speed reduction through bevel gearing and complete the reduction through spur gearing than it is to depend upon bevel gearing for the entire reduction in speed. Similarly, as spur gearing is relatively more efficient than worm gearing, there is less loss in the spur-gear reduction than there is in a worm-gear transmission of the same ratio.

A homely comparison illustrating the same principle may serve to make the foregoing explanation more apparent. If a wagon ran into a mud hole and you went to extricate it by manipulating the wheels, you would certainly grasp the spokes toward the rim of the wheel and then apply your force, not near the hub.

That the internal gear drive is a decided *economy* in the propulsion of motor trucks will appear quite evident upon a little analytical consideration. A gasoline motor, as you know, cannot carry economically any amount of overload, so the full power of the engine is rarely utilized except in starting the truck, and when it is once under headway less power is ordinarily employed to keep it in motion. If the full power of the engine is necessary to start a truck, let it be assumed that three-quarters as much is required to propel the vehicle at its customary speed. At three-quarters load, the consumption of gasoline per horsepower developed—the motor running smoothly—is approximately 10 per cent. more than if the engine operated at full-power capacity. In other words, the mechanical efficiency of the truck under such conditions—the index to gasoline consumption—would be proportional to the reciprocal of 82.50 (0.75×1.10). With an internal gear drive—due to the "leverage" developed—assume that the average power for driving the truck when once in motion entails the use of 50 per cent. of the power the engine is capable of developing. At one-half load, the consumption of gasoline per horsepower is approximately 82.5 per cent. more than when the engine is delivering its maximum, or the mechanical efficiency of the truck would be proportional to the reciprocal of 66.25 (0.50×1.325)—a saving of over 19.5 per cent. in the consumption of gasoline.

The foregoing computations are based on arbitrary assumptions, it is true, but I understand that with heavily loaded trucks with Torbensen, or similar, axles economies approaching these figures have been realized.

REGINALD TRAUTSCHOLD.

Bucking "The System"

BY ARTHUR A. BOYD

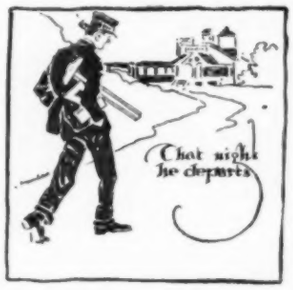
Many draftsmen have entered a new drafting room with the noble intention of doing their damnedest to make the first day's work one of accomplishment, only to have it turn out to be a day of effort wasted in trying to find the ropes of a "system" of drawing numbers that strikes dismay to the heart of a newcomer.

As a rule the chief gives the newcomer a memorandum that reads something like this: "Cylinder head No. 9467-C; order No. 7872; change to fit special cylinder on order No. 7876—RUSH!" He then tells him that he can start in with that job for the present.

Not wishing to give the chief a chance to suspect him of lack of intelligence, he makes a few discreet inquiries of a fellow worker with the result that he is soon in possession of sundry typewritten sheets known as "order No. 7872," from which he gathers that the cylinder head in question was made to please the whims of a man in Hunkytunk, Ariz. After digesting this information, he again refers to the original memorandum and asks the blueprint boy for drawing number 9467-C.

Returning to his board with a neatly folded blueprint he opens it and gazes at an assembly drawing of a steam engine. For a long time he stares at this work of art, noting a diagram in the right-hand corner that looks like a Presidential message done in algebra. Going to the chief, he learns that he is on the right road but still a long ways out. The chief points out that by looking at the diagram in the corner and following line No. 57 to the right until he reaches column "F" he will find "No. 6742," which is the drawing number of the assembly that will give him the part number of the cylinder head he requires.

Once more he returns from the blueprint file with a neatly folded blueprint. Opening it upon his table he stares at a drawing exactly like the first except for a new diagram. He turns sad eyes toward the chief but sticks to his stool determined to fight it out on that line if it takes all day. Picking up the typewritten sheets known as "order No. 7872," he searches through them. Ah, a clue! It mentions something about "cylinder No. 924 for 12-in. stroke engine, class XM." Searching through the diagram on the last blueprint he finds a number, 924, and tracing along the line learns that he is to see "drawing No. 7861-C."

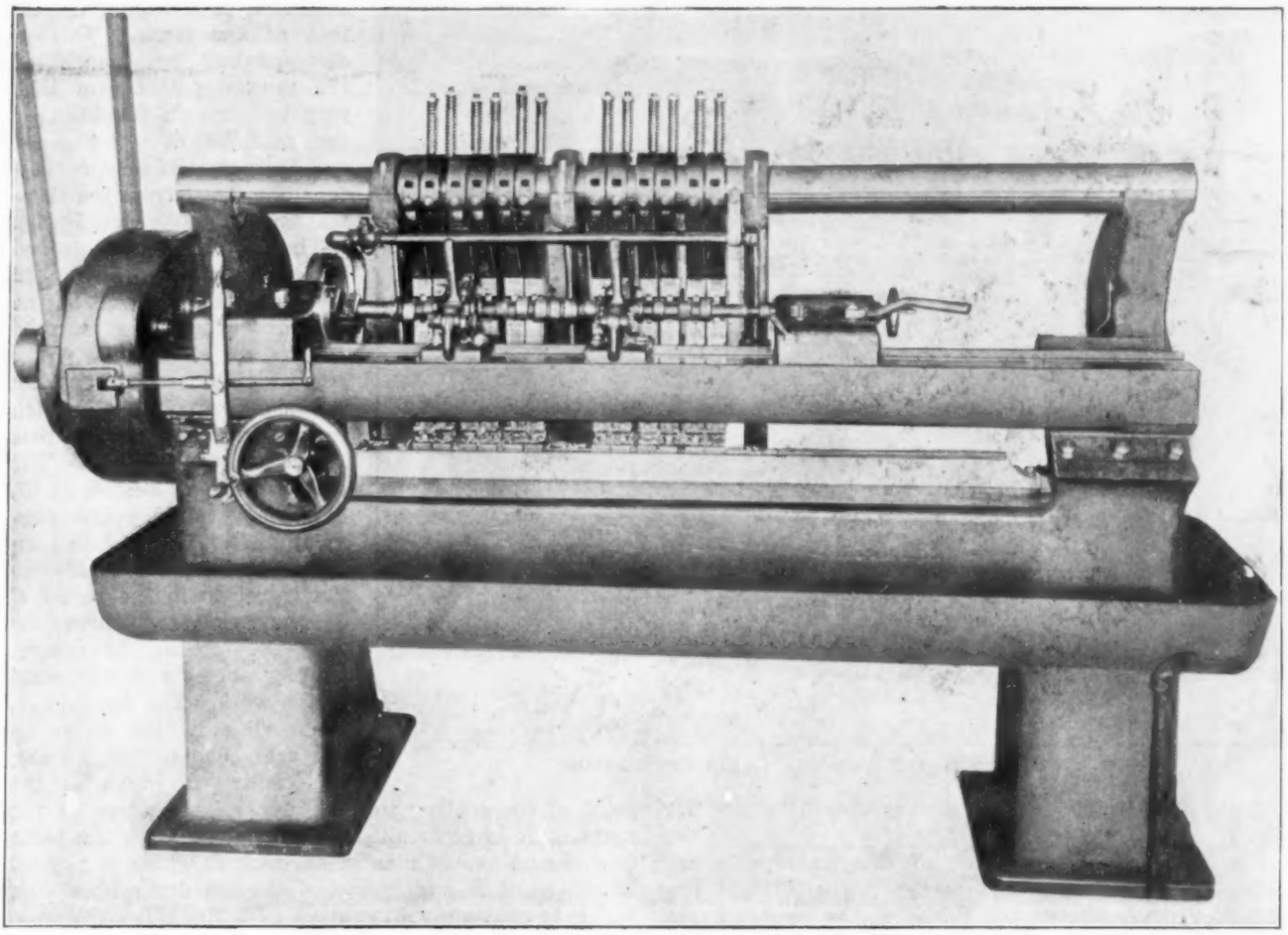


Returning once more to the boy at the blueprint files, he asks for said drawing and, with blood in his eye, returns to his stool with it clutched in his hand. As he slides onto his stool he glances at his watch. Wow! it's after eleven. Unfolding drawing number 7861-C he spreads it out upon his table and stares at a drawing of a cylinder head *without dimensions!* With a burning sensation at the back of his throat he stares out the window. After a time he once more takes up the chase. Noon arrives and the newcomer goes out and finds a hash-house and eats his dinner and, after bracing himself with twice his usual number of smokes, returns to the drafting room with new courage.

About three o'clock that afternoon he discovers that in some unknown manner he has found a drawing that *may* be the one he is searching for. With flushed cheeks and trembling fingers he takes it to the chief and receives the glad news that it is the cylinder head in question. The chief even points out the flange that is to be fitted to the cylinder mentioned in the memorandum. With a feeling such as Columbus must have had when he first saw land the newcomer returns to his stool. He feels that he has earned a vacation and makes the rounds of the drinking fountain and washroom, returning with new hope.

Seating himself upon his stool he gazes with burning eyes upon the cylinder head, observing that the title fails to mention the fact that it is a cylinder head. It might be a swivel for a ducks foot for all the title cares. He looks slowly at the flange he is to change, at the same time dragging from beneath the pile of now worthless prints the memorandum given him that morning. From this he reads that he is to fit this flange to cylinder on "special order number 7876."

No, Dear Reader, they do not pick up his lifeless body from the floor with tender hands, nor send for the chief of police. With glazed eyes and parched mouth our hero stares at the distant skyline. That night he departs a trifle later than the others, his pockets bulging with concealed drawing instruments (yes, his own) and several scales stuffed into his shoe tops. He is too weary to make explanations. That same night the outbound train has a passenger who looks reckless and smokes late into the night.



The Gordon Camshaft Lathe

By J. V. HUNTER
Western Editor, *American Machinist*

A machine of the lathe type, which is described, has been built for the purpose of turning the cam surfaces of the camshafts used for operating the valves in gasoline motors. The machine rough-turns the cams from the drop-forgings, the work being performed previous to heat-treating.

IN DESCRIBING a machine tool today, almost the only point of real interest to the user is the question, What will it produce? In answer to that query, its production records can be expressed either as a quantity factor or in terms of accuracy, and in many cases both of these are controlling features. In some cases where the required degree of accuracy is necessarily implied, we need only consider the machine's productive value.

Watching the Gordon camshaft lathe rough-turning the cam surfaces of camshafts for internal-combustion engines, it seemed that the high productive feature of this machine was the real point of interest to those engaged in producing such shafts. These machines are being built by Charles Gordon, Inc., Milwaukee, Wis., and the writer recently had the opportunity of seeing one of them in service in a large automobile factory, where it was engaged in turning the cam faces on the shafts direct from the rough forgings at the rate of 16 shafts per hour.

The machine is shown in Fig. 1, and it will be seen that it differs radically from standard lathe construction and operation; first, because the work travels past the tools to obtain the feed; and second, because the tools are at the rear of the work, and the work rotates opposite to the customary direction.

The work is supported on centers in the head and tail stocks carried on an auxiliary bed *A*, called the platen. The tailstock is adjustable to provide for handling different lengths of shafts up to 60 in. The headstock is also adjustable for position within short limits to provide for turning cams when they are spaced unusually close as will be explained later. The feed is provided for by longitudinal travel of the platen which slides on the end frames of the main bed from left to right. The platen is driven by a screw feed and carries the work at the necessary rate across the points of the cutting tools.

The work is rotated by the head or driving center *B* which is connected to an eight-splined shaft that passes through the gear box and provides constant drive for the center throughout the entire 3 in. of the platen travel, although this may be regulated within any suitable shorter limits by adjustable stops. The driving center is provided with an Oldham floating drive with

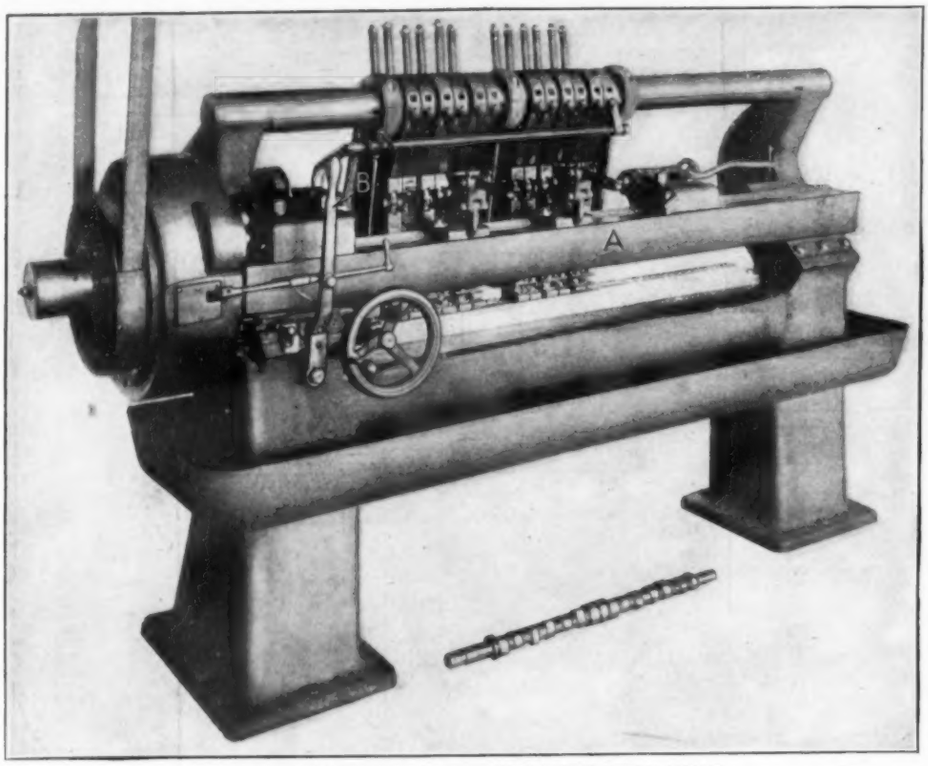


FIG. 1. FRONT VIEW OF THE CAMSHAFT LATHE

a double-tailed dog for equalizing the drive on the work.

The most important feature of this machine is the method of tool control that makes it possible for the tools to produce the proper forms of the cams. From the diagram, Fig. 2, it will be noted that as the camshaft revolves, not only is there a varying distance between the shaft and the point of contact of the tool, but the surface presented to the cutting tool is constantly changing in angularity. When the camshaft is in the position *A*, the clearance angle of the tool in relation to the work will be approximately normal, as occurs again at the position *C*, but when the shaft is at either of the intermediate positions *B* or *D* the conditions are very unsatisfactory for cutting. In the position *B* the work is being forced down upon the tool, giving an obtuse chip angle, while in the position *D* the clearance angle must be so far undercut that in some cases the tool point might become almost a feather edge. To overcome such conditions it is necessary to have the tool undergo a gradual change of position, which enables it both to conform to the contour of the cam, and to maintain it in a theoretically correct cutting position with reference to the angular surface of the work. This is accomplished by means of the swinging tool arm that may be seen on the back of the machine at *A*, Fig. 3, and their details may be better understood from the illustration of a single arm, Fig. 4.

These tool arms, guided by master cams, swing to and from the camshaft as the contours of the cam surface require. For this swinging motion they are hung from the shaft *B*, Fig. 3, which passes through the large hole *A* in the arm, Fig. 4. The cutting tool is located at *B*, and is held in the geared segment *A*, Fig. 5, which in turn is fastened to, and is free to partly rotate in the recess *C* of the arm *D* in order to keep the tool at the correct cutting angle with reference to the work. The segment *A*, in moving in its recess in the arm *D*, describes an arc, the center of which is the point of the cutting tool. The partial rotation of the segment *B* is accomplished by meshing with the teeth in a second geared arm or segment *E* which is pivoted at the point *F* and is rocked up and down by a cam which is constantly in contact with the roller *G*.

The result of this tool rotation can best be understood from the diagram of its action shown in Fig. 6, which starts with the tool in the neutral or normal position

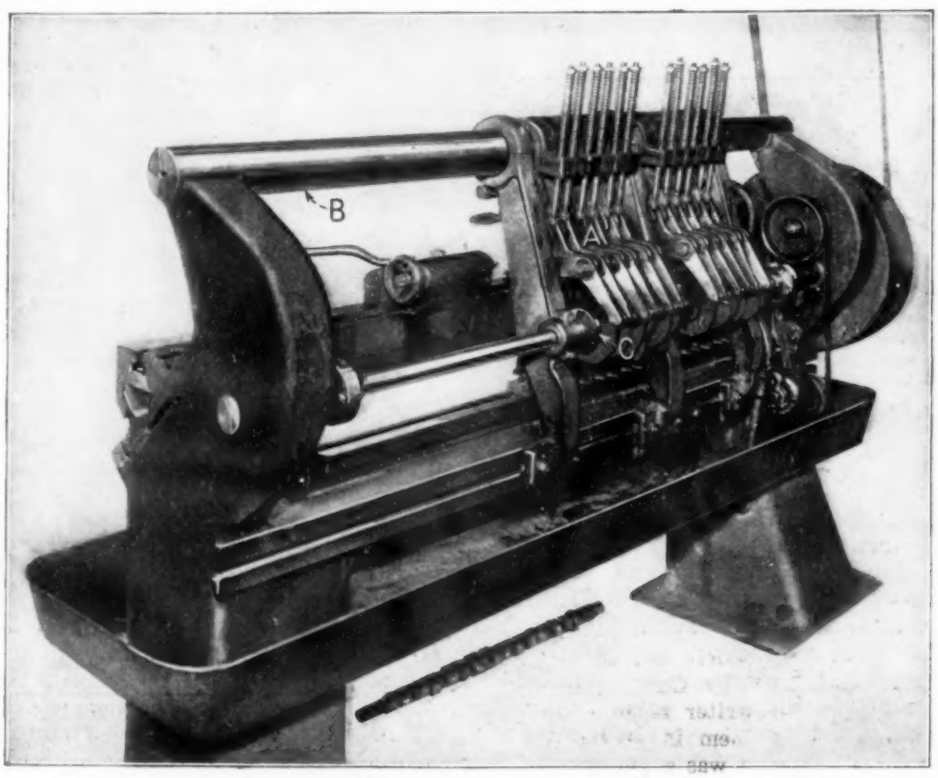


FIG. 3. REAR OF THE LATHE SHOWING TOOL ARMS AND THE CAMS

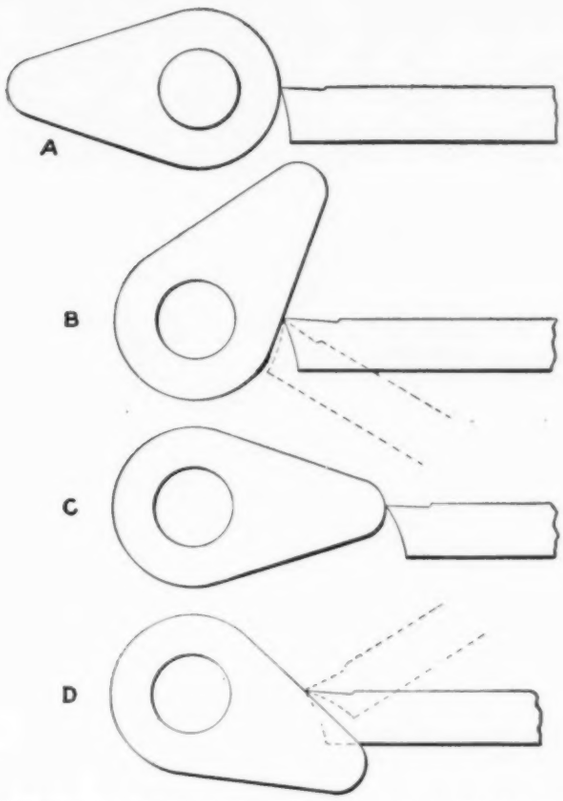


FIG. 2. DIAGRAM OF POSITIONS OF STATIONARY TOOL ON REVOLVING CAM

when working on the circular part of the cam as shown at *A*. When the cam revolves into the position *B* the tool has been tilted to the proper cutting angle, but it again returns to the normal position where cutting on the toe of the cam at *C*. When it reaches the opposite face of the cam at *D* the tool is tilted in the opposite direction to that at *B*, so that the necessary clearance angle is properly provided for.

During all of the tilting motions of the tool it is being rocked in and out from the center of the camshaft by the operating cam and the point of the tool (being the center of its own rotation) constantly follows the outline of the cam. Two cams are required to control the necessary motions of each rocker-arm, one for the main and the other for the supplementary motion. These are mounted on the shaft at the rear of the machine at *C*, Fig. 3, and this shaft is geared so that its rotation corresponds with that of the camshaft which is being worked upon. The shapes of all the cams vary noticeably for different designs of camshafts though the ones for the secondary tool motion are even more radical in their forms. Circular tools of high-speed steel are used and as their design provides the necessary clearance angle it is only necessary to grind them on the top face for resharpening, and they may be used about half way around before discarding.

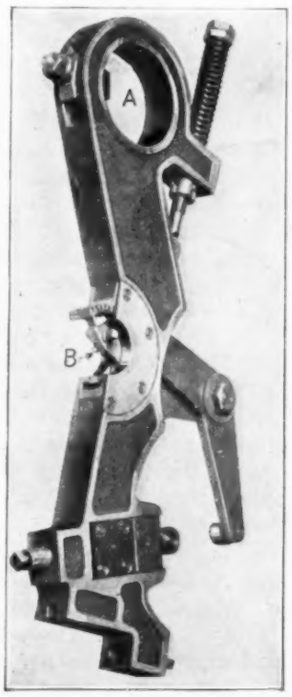


FIG. 4. ASSEMBLED TOOL ROCKER-ARM

Owing to the requirements of machine design, the closest setting of the tool arms that is possible is 1½ in. between tool points. Should camshafts have their cams placed at closer intervals, it is necessary to finish the shaft at two settings, completing every other cam

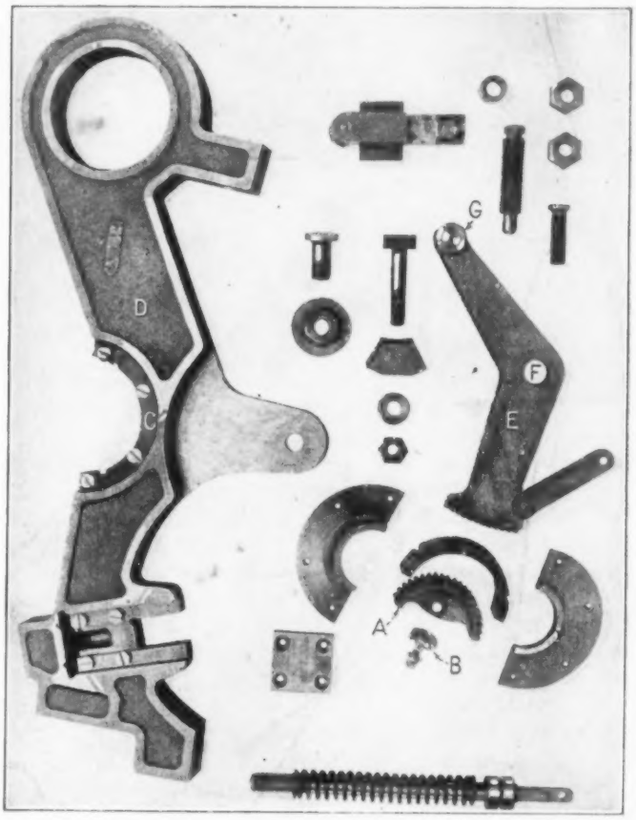


FIG. 5. PARTS OF THE ROCKER-ARM AND TOOLS

at each setting. This is the condition, previously mentioned, which requires that the headstock be set ahead the necessary distance to shift the camshaft so that the intermediate cams may be reached by the second lot of tools. However, all of the tool arms are mounted on the machine at the same time, in the same relative position that they would occupy should it have been possible to finish all of the cams at a single operation.

The tools are subjected to little strain by the feed, for although they are called upon to remove from $\frac{1}{16}$ to $\frac{1}{4}$ in. of stock from the shafts, depending often upon the accuracy with which they have been centered, the feed is kept low and the machines so far built have been geared up for a feed of 0.0057 in., while the speed of the spindle is 60 r.p.m. That the tools are fully capable of handling heavier cuts is shown by the fact that under test the machine has been geared to a feed of 0.015 in. while the work was run at 120 r.p.m. An automatic trip is provided which throws out the feed at the conclusion of the cut across the face of the cams. After finishing each cut the platen is returned to its starting position by a handwheel.

The cams are intended to remain permanently mount-

ed in sets on their drive shafts and thus can be very rapidly replaced with a different set by changing drive shafts when setting up for another job.

The machine is designed for either motor or belt drive, and a special housing has been designed to cover the belt pulley. This may be turned upward for overhead drive, or rotated to the back and downward when the machine is to be driven by a motor mounted on belt-tightening base at the rear of the machine. A Fulflo pump, belt driven and equipped with a special belt tightener, is provided to supply lubricant to the cutting tools. An attachment is provided for turning the oil pump eccentric which is a part of the camshaft on some designs of engines, this work being accomplished at the same time that the cams are being turned. When practical, the camshafts are supported by a steadyrest at the center bearing which, together with the outer bearings, have been previously turned.

In connection with the work of this machine, a supplementary device, Fig. 7, has been built for grinding the controlling cams to form. This uses as guides master cams which have been finished very accurately to form. The cams for the lathe are first finished close to their final dimensions and hardened, and are then ready for finish-grinding, this latter operation being performed in the machine shown. For grinding, the machine employs a small wheel which is directly driven by a light motor, carried on a swinging arm. The lathe cams are mounted singly on the arbor *A* while the master cam is on the arbor *B*, and both are rotated simultaneously by the handwheel *C*. A point of contact with the master cam which is mounted on a knife-edge in the supplementary rocking-arm *D*, causes the rocking-arm *E* to keep the wheel constantly in contact with the proper point on the cam which is being fashioned.

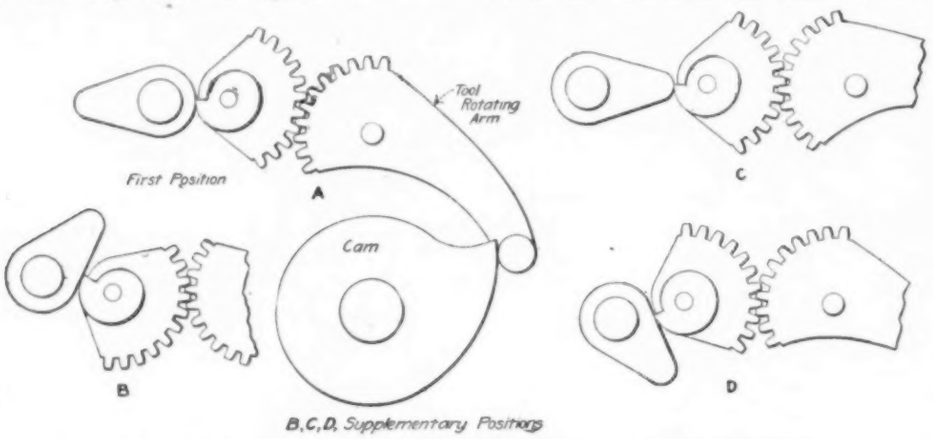


FIG. 6. POSITIONS OF ROTATING CUTTING TOOL WHEN WORKING

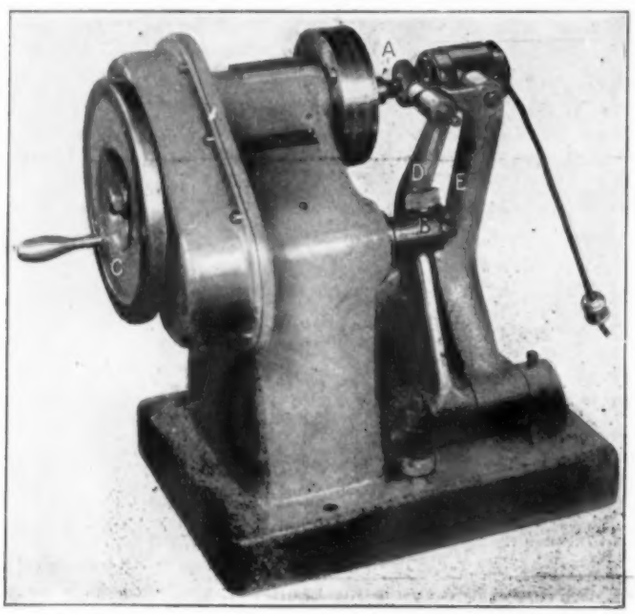


FIG. 7. SPECIAL MACHINE FOR GRINDING CONTROL CAMS

Welding and Cutting

By S. W. Miller
Rochester Welding Works, Rochester, N. Y.

In commenting on the article on page 685 of the *American Machinist* with regard to the expansion and contraction examples given, Fig. 194 does not seem to me correct.

It should be clearly understood by the welder that in a restrained weld, which is one entirely surrounded by metal, such as a crack in the center of a plate, it is impossible to get rid of both strain and distortion; a moment's thought will make this clear. Such a crack is shown in Fig. 1. When crack *A* is welded the metal between *B* and *C* is heated hotter than that between *D* and *E*, and *F* and *G*, and, being soft, the expansion crushes it; so when cooling occurs, *B* to *C* contracts more than the rest of the plate, which either causes a crack, or leaves a tensile strain in the plate. It is true that the strain can be relieved by annealing, but that leaves a distortion of some kind; if the distance *BC* be the same as originally, the thickness along *BC* must become less, and vice versa.

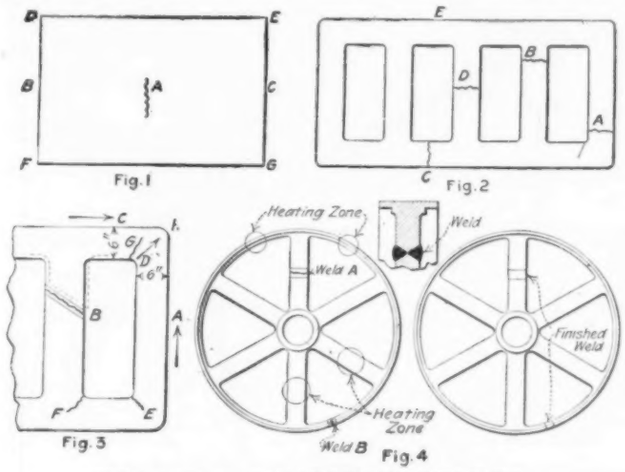
If this is not clear, let the welder heat a spot in the center of a ¼-in. plate of steel, and see what happens.

In a partly restrained weld, such as Fig. 185, page 686, it is evident that the method of preheating described produces expansion of the part to be welded in such a way that the opening of the crack is *the same at all points in its length.* In other words, there is no variation in the width of the crack after expansion and before welding.

This is an important principle to be noted in expansion and contraction problems; it may be worded as follows: A crack must always be opened the same amount at every point in its length, if both strain and distortion are to be avoided.

Fig. 2 shows the condition of a grating when received at the welding shop. The quickest and cheapest way to weld this, if three men are available, is to double bevel all breaks; use three men to weld *A*, *B* and *D* at the same time, first on one side and then on the other; clamp the piece on a flat table to keep it straight, and let it cool. Then have one man heat at *E* with a torch, and let another weld at *C* as at the other points.

If only one man is at hand, he should weld *D* first; then, keeping bar *D* hot, weld *B;* next, keeping both



FIGS. 1 TO 4. EXAMPLES OF WELDING

Fig. 1—A restrained feld. Fig. 2—Grating to be welded. Fig. 3—Result of improper heating. Fig. 4—Welding a broken pulley.

B and *D* hot, weld *A;* allow the piece to cool, heat *E* and weld *C* as before.

This brings out the principle that one should *never finish* a weld in the *center* of a piece, unless it is *absolutely necessary;* always finish at the edge.

It will be seen that the method just described keeps the sides of the cracks parallel, and that if the proper allowance is made for contraction, there will be no strains left in the welded piece.

The matter may be made clearer by a study of Fig. 3, which indicates the result of improper heating. Heating the corner *H* for crack *B* will lengthen sides *A* and *C*, the resultant of these being in the direction of *D;* so that the upper part of crack *B* will lie as in the dotted lines, and after welding and cooling there will be strains at *E*, *F* and *G* which will surely cause cracks in service, if not at once.

With a smaller grating it is possible that there would be spring enough in the bars to avoid breakage; but there would be strains that could be avoided by other methods. The basic principle of all welding is to weld without having either strain or distortion in the finished piece.

In working on automobile cylinders it is usually unnecessary to preheat at all when welding lugs; in cases where it is necessary, only a very slight amount is needed—just enough so the cylinder cannot be handled without tongs.

Usually jacket cracks can be welded at much less than a red heat. In fact if a red heat is used, in most cases the cylinder bores will warp badly.

The important points in cylinder welding are a *uniform soaking* heat, not necessarily very high, welding on rising temperature, and slow cooling.

Never weld an important break in a cylinder block without about three hours slow preheating, never allowing the fire to die down. Then pack it in loose asbestos in the fire, to insure slow cooling. Of course, there are exceptional cases where the break is so bad that high preheating is needed.

With regard to pulley welding such as shown in Fig. 4, the rim should be heated on both sides of the broken spoke to lengthen the rim and pull the crack *A* open, and the spoke should be kept as cold as possible. Also all spokes should be welded from both sides.

The break at *B* should be opened by heating the spokes next to it so that when the crack is open enough, the edges of the break will be the same distance from the center; this of course means different amounts of heat in the two spokes.

I question the economy of the method of welding the shear arm, page 698. The removal of about 28 cu.in. of iron with a welding torch, when it could be done at one-tenth of the expense in half the time with a 12-lb. sledge and a handle chisel, seems to me to be a serious economic waste, especially as it is unnecessary.

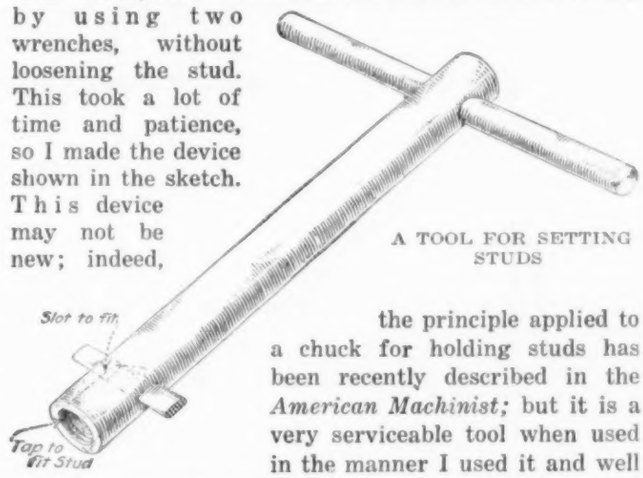
Again, preparing more from one side than the other means more welding than with the V equal on both sides. In the case given the method described requires about 140 cu.in. to be filled in, while with 60-deg. angle V's equal on both sides (3 in. deep), the amount would be only 126 cu.in., or a saving of 10 per cent.

One further point; I have never known it to be necessary to preheat a gear to weld in broken teeth, when there was nothing else broken.

Tool for Setting Studs

BY J. PIELAGE

Having a lot of studs to set, I was using the time-honored method of putting on two nuts, locking them together and then tightening the stud with a wrench; after which, if one was lucky the nuts could be loosened by using two wrenches, without loosening the stud. This took a lot of time and patience, so I made the device shown in the sketch. This device may not be new; indeed, the principle applied to a chuck for holding studs has been recently described in the *American Machinist;* but it is a very serviceable tool when used in the manner I used it and well worth the trouble of making, from the standpoint of time saved, if one has many studs to set.

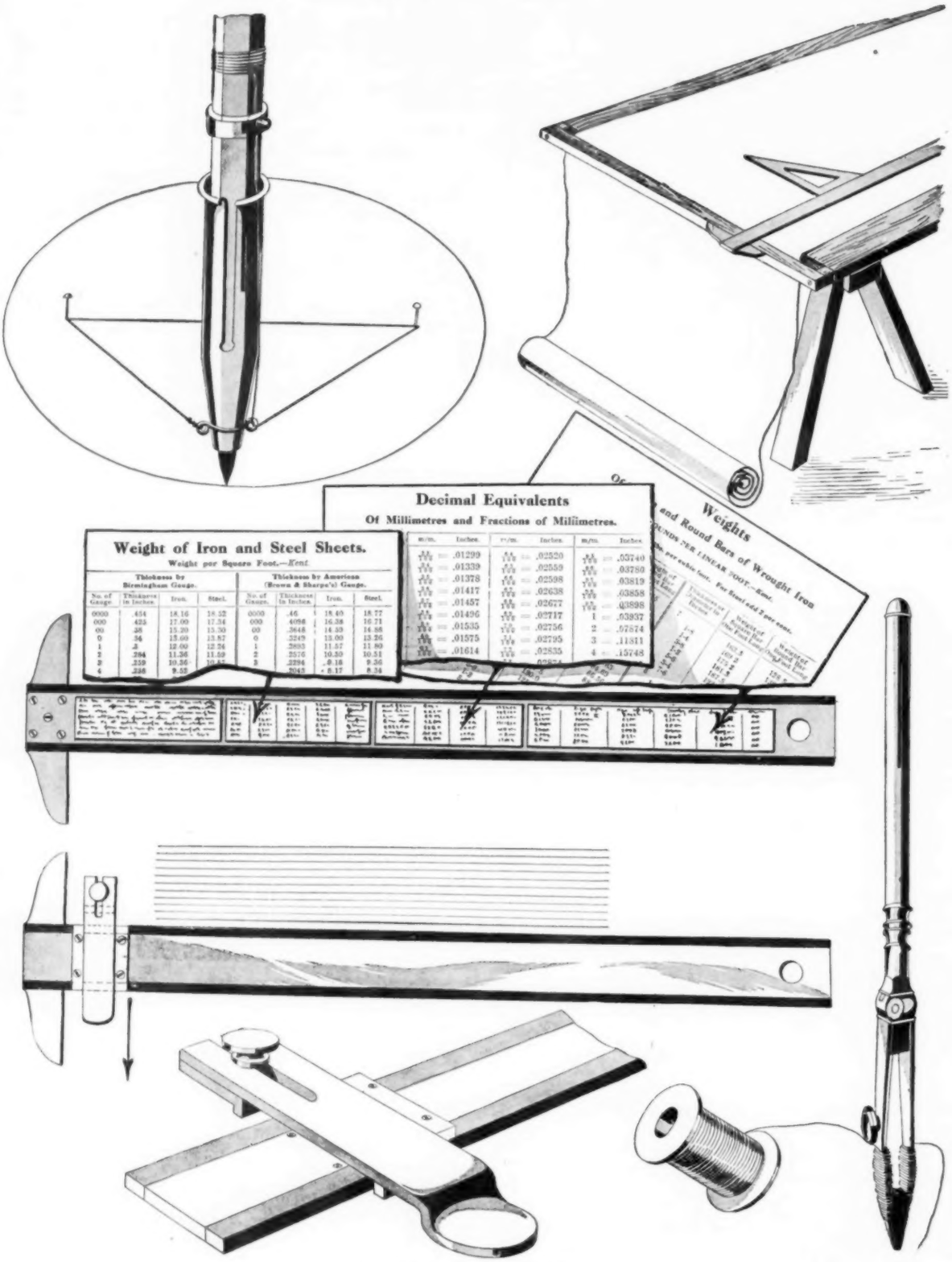


A TOOL FOR SETTING STUDS

The construction is obvious from the drawing. The drift may be the small key from any small drilling, or other machine that uses taper-shanked tools. To use the device run the stud in until it touches the drift and then strike the large end of the latter a smart blow with a hammer. Now turn in the stud, setting it up as tight as you have a mind to. A tap with a hammer on the small end of the drift will release the pressure, and the tool can be run off the stud with the thumb and fingers.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas


Weight of Iron and Steel Sheets.
Weight per Square Foot.—Kent
Thickness by Birmingham Gauge.
Thickness by American (Brown & Sharpe's) Gauge.
Decimal Equivalents
Of Millimetres and Fractions of Millimetres.
Weights
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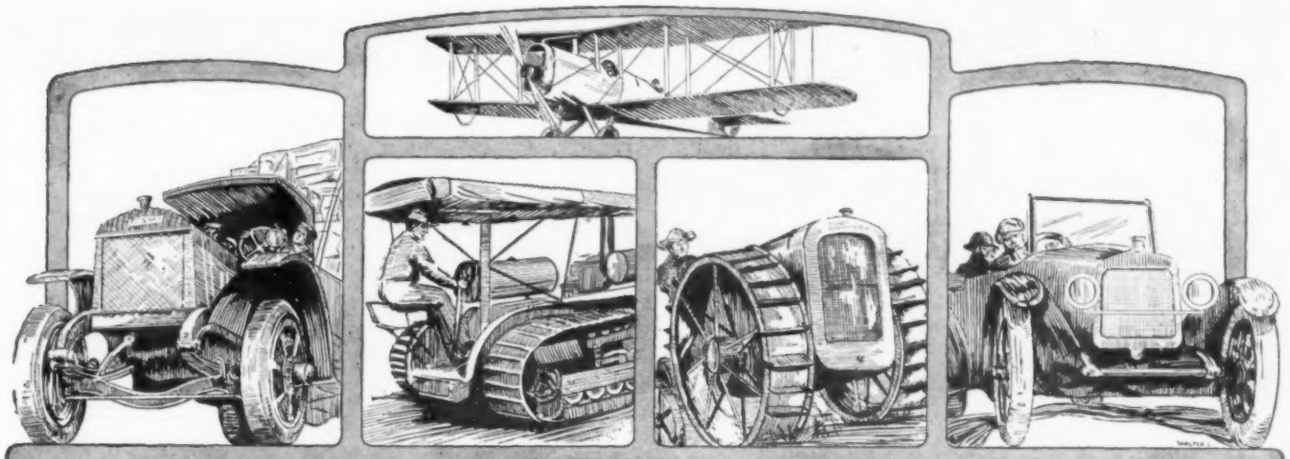
DRAFTING-ROOM KINKS



The Hispano-Suiza Airplane Engine—VIII

By H. O. C. ISENBERG
Works Manager, Wright-Martin Aircraft Corporation, New Brunswick plant

The component parts of the engine under consideration are so numerous and the many operations incident to their production so similar that to describe them all would not only weary the reader but would serve no practical purpose. In this closing article on machining processes, only a few of the parts, such as the crankshaft, crank case, camshaft and piston are dealt with. These parts are illustrated and a description of some of the operations they undergo are given. A few notes on assembling are also included.

THE crankshaft, Fig. 119, which is finished all over, is a beautiful piece of work and must undergo many operations before it is completed. The hole through the center is drilled on a Pratt & Whitney gun-barrel drilling machine and within limits that would compare favorably with the best practice in making gun barrels.

The turning and grinding are as usual with work of this character, detailed descriptions of which have been published in the columns of the *American Machinist* from time to time.

Between many of the operations the crankshaft is straightened and this is done again as a final operation. Fig. 120 shows it on the straightening table while Fig. 121 shows it on the gaging table ready for the final inspection with all the gages used in full view.

The camshaft, Fig. 122, is another product of the grinding machine in which the contour of the cams is produced by the use of master cams or formers on the grinding machine. This leaves the cam surfaces in fine shape but not good enough to pass the rigid inspection required, so a final finish is given with an oil stone that approaches a razor hone in texture. This is done by girls who have an exceedingly fine sense of

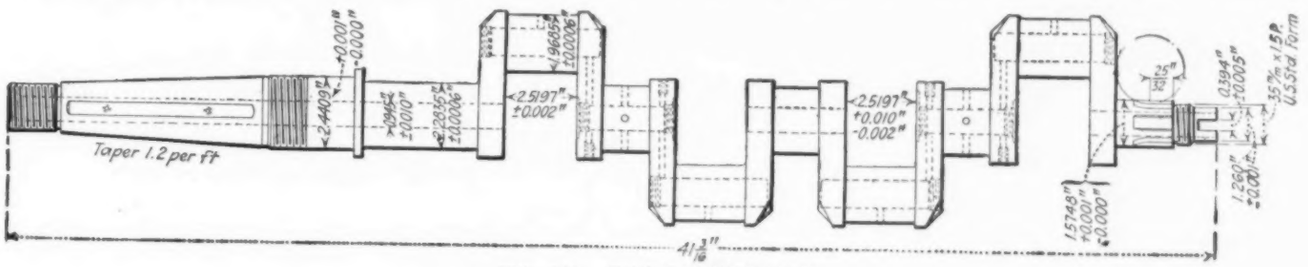


FIG. 119. THE CRANKSHAFT

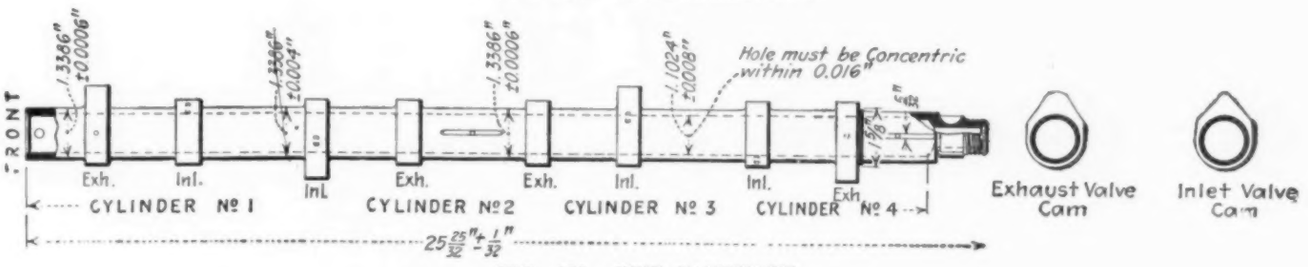
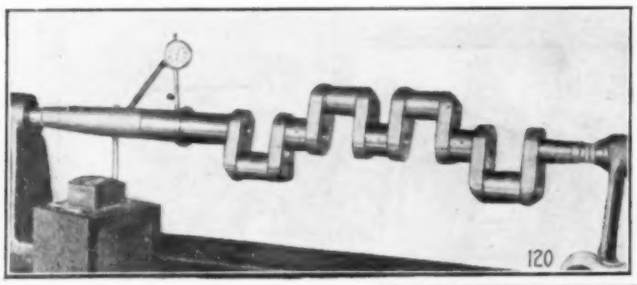
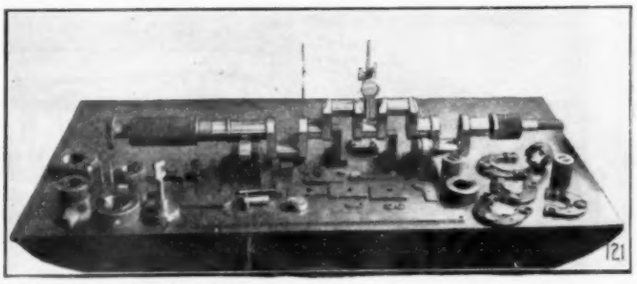
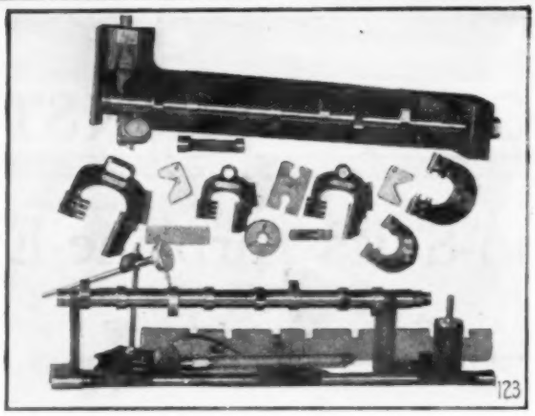


FIG. 122. THE CAMSHAFT

AUTOMOTIVE CONSTRUCTION







FIGS. 120, 121 AND 123. THE STRAIGHTENING TABLE AND GAGES FOR CRANKSHAFTS AND CAMSHAFTS

Fig. 120—The crankshaft on the straightening table. Fig. 121—The crankshaft and the gages used for its inspection. Fig. 123—The camshaft and the inspection gages.

touch and who become very expert. A finished camshaft with all the gages used for its final inspection is shown in Fig. 123.

The camshaft bearings are made of phosphor bronze and are shown in place on the cylinder block and ready for reaming in Fig. 124. Fig. 125 shows the reaming jig clamped in place for the operation. Power is supplied by compressed air and universal joints are used in the connection between the reamer bar and the motor shaft so that the alignment is entirely controlled by the jig.

The forward bearing is closed to prevent escape of oil at that end by a planchet of brass placed in a seat provided for that purpose, the metal of the bearing being rolled down around its edges to hold it securely in place and seal the joint. Fig. 126 shows a planchet in place at *A* while another one may be seen on the flange of the cylinder block at *B*. The device used is shown in Fig. 127 in which the rolls *A* are attached to the head *B*. Rotary motion is imparted by the lever *C* and as the rolling progresses the nut *D* is tightened, causing the rolls to bear harder against the end of the bearing.

The crank case is in two parts, outlines of which are shown in Figs. 128 and 129. The joints between the two parts and those where the cylinders join the upper part are roughed out by milling and afterward lapped on cast-iron lapping plates, in which operation pulverized glass is used as an abrasive. Fig. 130 shows the parts on the lapping plates.

In tapping the holes for attaching the cylinders, the jig, Fig. 131, is used. This is positioned on the work by the dowel pin *A* (see bottom of jig in the foreground) which enters a dowel hole in the casting and the pilot *B* which enters the hole for the vertical shaft. It will be seen that the tap shown in one of the holes in the upper jig and the one lying on the jig below are both provided with wrenches having pivoted handles set parallel with the axis of the tap. The use of such wrenches makes the tapping easy and thus saves considerable time.

Boring and reaming for the crankshaft bearings are shown in Figs. 132 and 133 and one of the reaming bars may be seen in Fig. 134 where the reamer blades are being adjusted to ream a hole to within the required tolerance. In adjusting the blades, shims of tinfoil 0.0005 in. thick are used and the dial indicator shown in the illustration is used to test the accuracy of the adjustment.

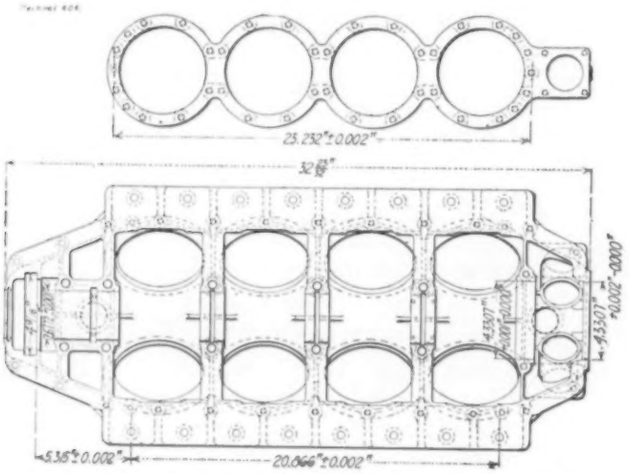


FIG. 128. UPPER PART OF THE CRANK CASE

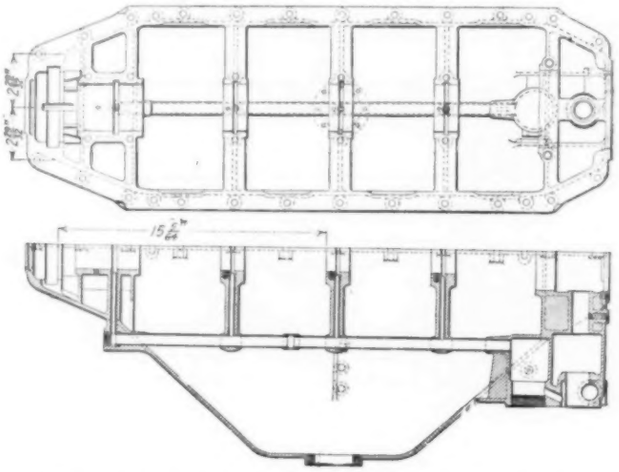
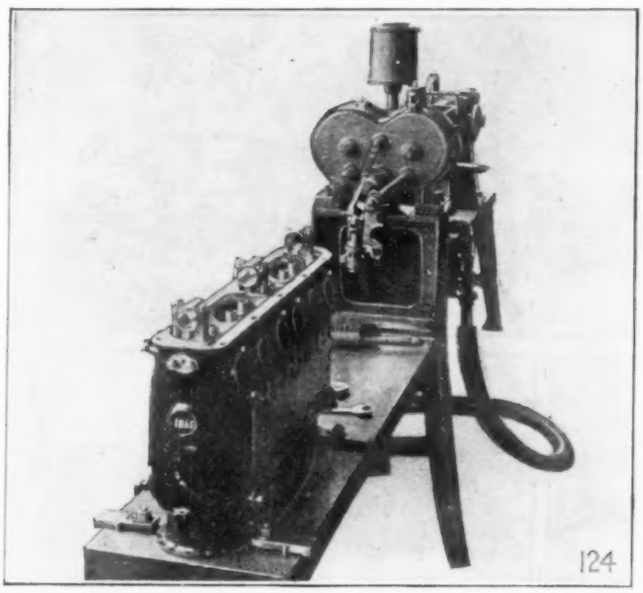
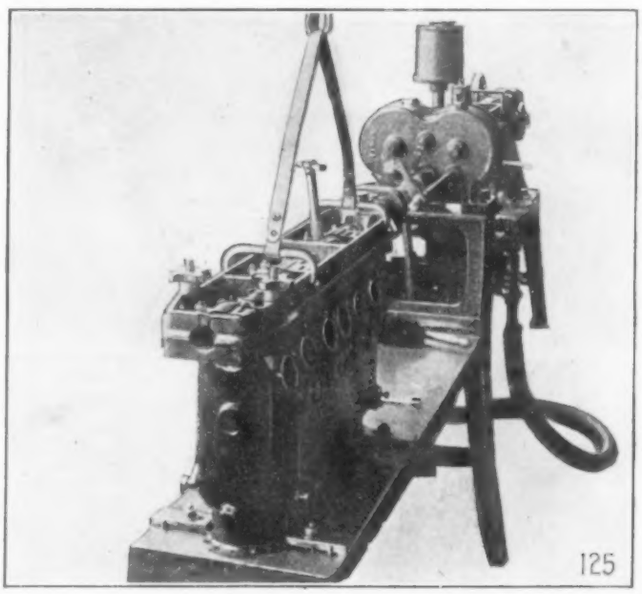
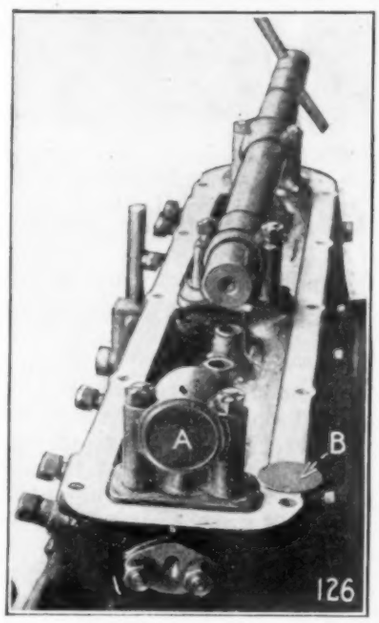


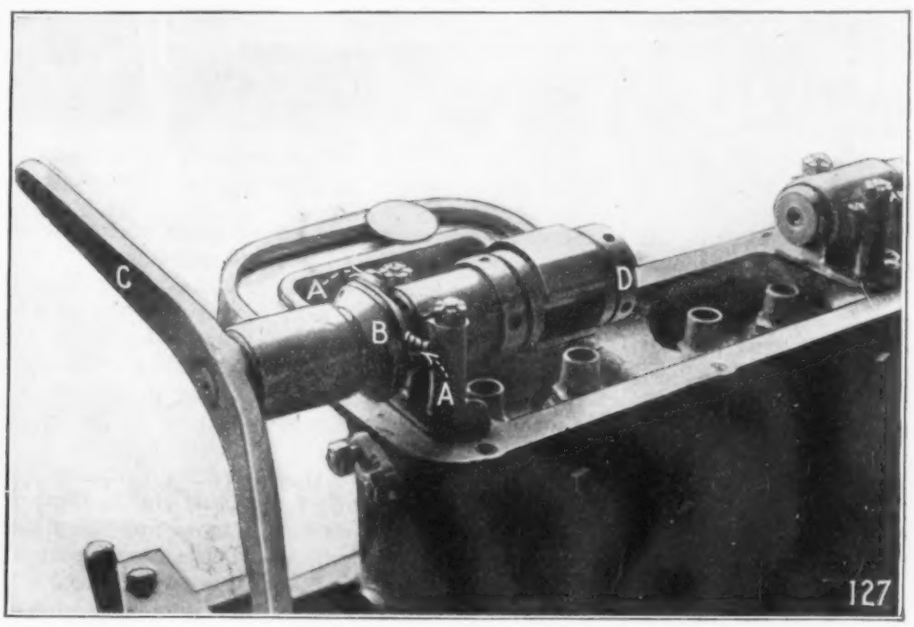
FIG. 129. LOWER PART OF THE CRANK CASE

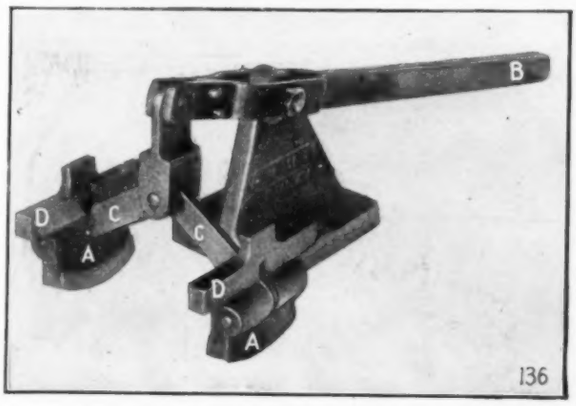
AUTOMOTIVE CONSTRUCTION

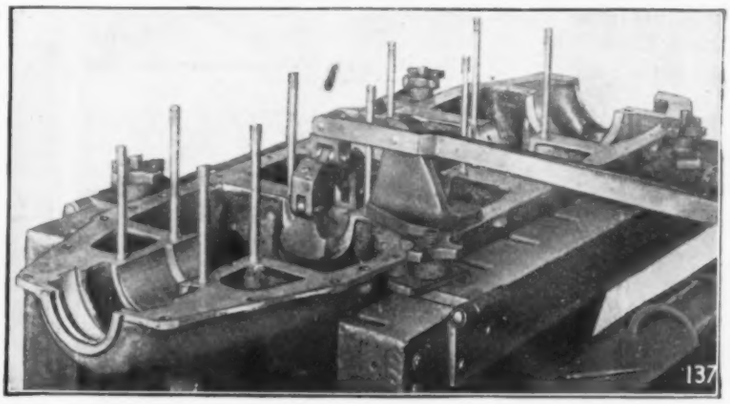








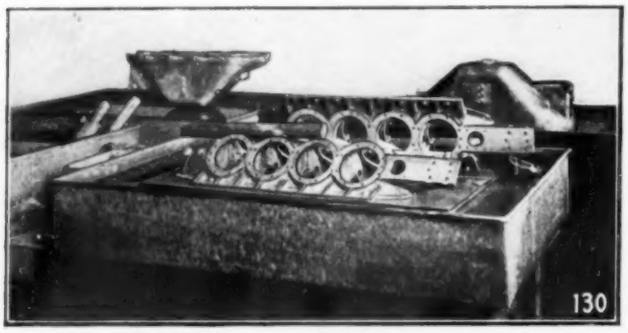


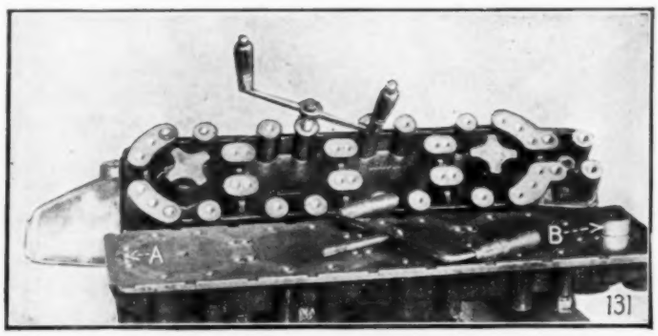


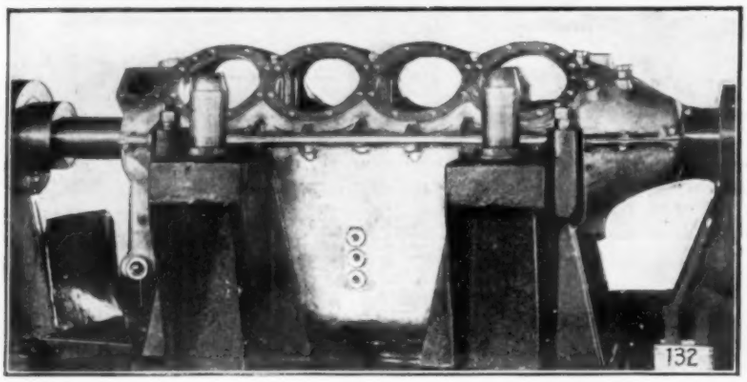
FIGS. 124, 125, 126, 127, 136 AND 137. OPERATIONS ON CAMSHAFT BEARINGS AND BEARING DEVICE

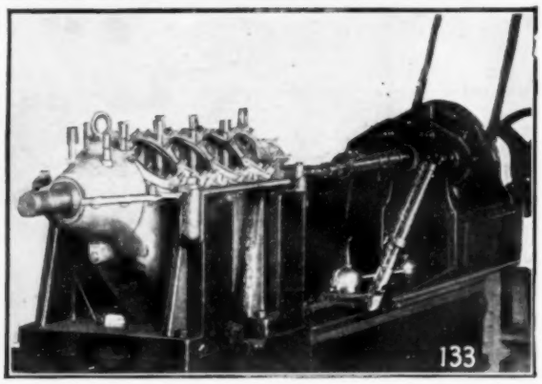
Fig. 124—The bearings in place. Fig. 125—Reaming the bearings. Fig. 126—How the end bearing is closed. Fig. 127—Securing the planchet. Figs. 136 and 137—Device for removing bearings.

AUTOMOTIVE CONSTRUCTION









FIGS. 130 TO 133. OPERATIONS ON THE CRANK CASE

Fig. 130—Lapping the joint. Fig. 131—A tapping jig. Fig. 132—Boring the bearing seats. Fig. 133—Reaming the bearing seats

All the pedestals are straddle-milled to a gage so that when the bronze bearings are fitted into place they will be located properly and their flanges will fit snugly against both sides of the pedestals. The gang of cutters used for this operation is shown in place in the special milling machine in Fig. 135. The knee *A*, against which the joint of the crank case is clamped, is fastened to the slide of the machine so that the work can be fed bodily to the cutters.

In fitting the bronze bearings to the pedestals they have to be put in and taken out several times, and for taking them out the device shown in Fig. 136 is used. The ledges on the jaws *A* grip the flanges on the bearing so that downward pressure on the lever *B* tends to lift out the bearing. In the lifting movement the jaws are prevented from spreading by the action of the links *C* and the guides *D*. Fig. 137 shows the device in place ready to lift out a bearing and illustrates the manner of its use so clearly that no further comment is necessary.

The piston, Fig. 138, is a copper-aluminum casting and while the hole for the pin is required to be within remarkably close tolerances, its production otherwise presents no difficulties to a well-equipped shop.

The piston rings are lapped to give them a good bearing in the cylinders and the work is done in the special machine illustrated in Fig. 139. Sets of condemned cylinders are mounted on each side of the machine and in them dummy pistons with the rings to be lapped are placed and connected to the vertical rods *A*. These are given reciprocating motion by means of the eccentric *B*, connecting-rod *C* and the rocker-arms *D*. As the piston and rings are pumped up and down within the cylinders, they are slowly rotated by worm gearing

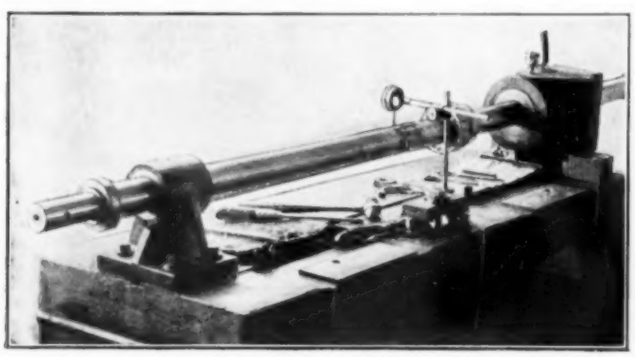


FIG. 134. ILLUSTRATION SHOWING ONE OF THE REAMING BARS

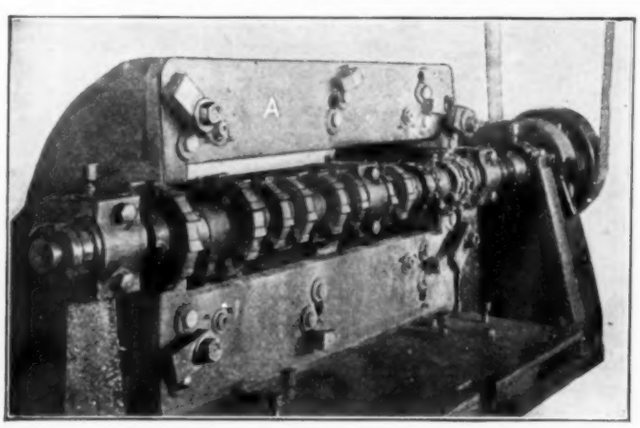


FIG. 135. MACHINE AND CUTTERS FOR STRADDLE-MILLING THE PEDESTALS

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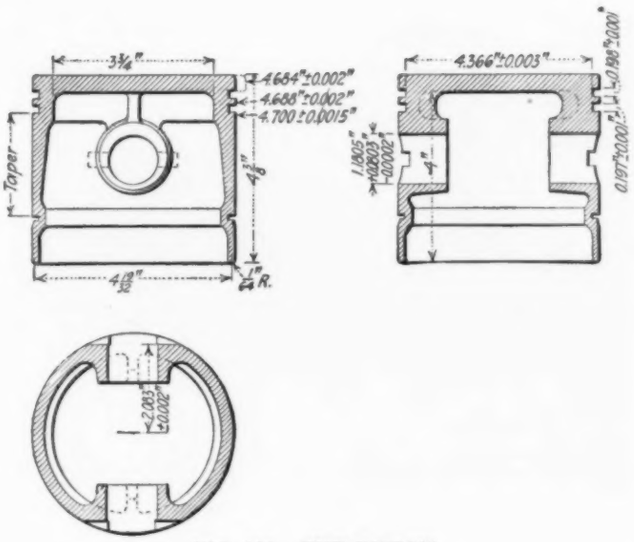


FIG. 138. THE PISTON

located in the perforated case *E* and at the same time an abrasive mixture of pumice stone and kerosene is fed to the work.

The weight of the moving parts is counterbalaned by the weights *G*, while stopping and starting is effected by a clutch controlled by the lever *H*. The machine is double, provision being made for a set of cylinders on the opposite side. It makes 60 strokes per minute and is continued in operation until the rings show a satisfactory bearing.

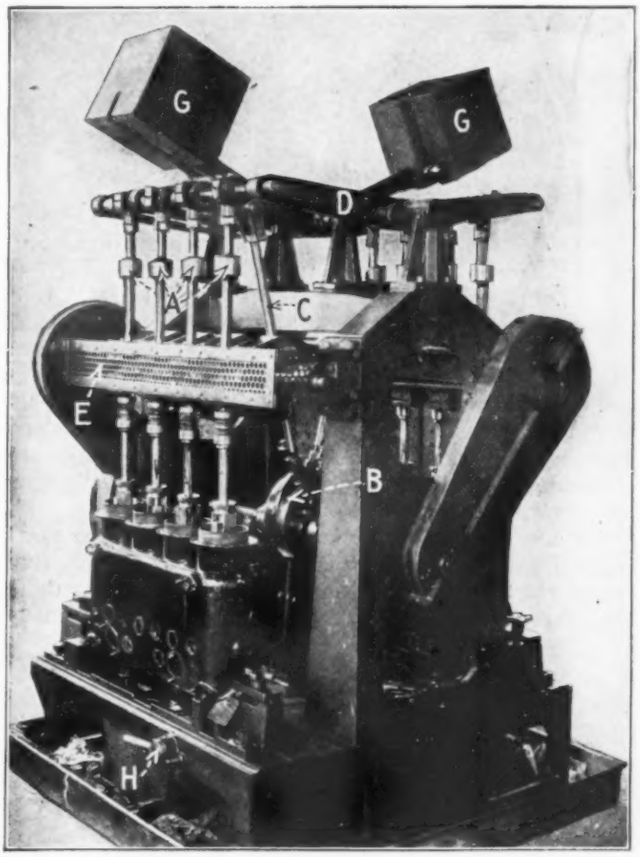
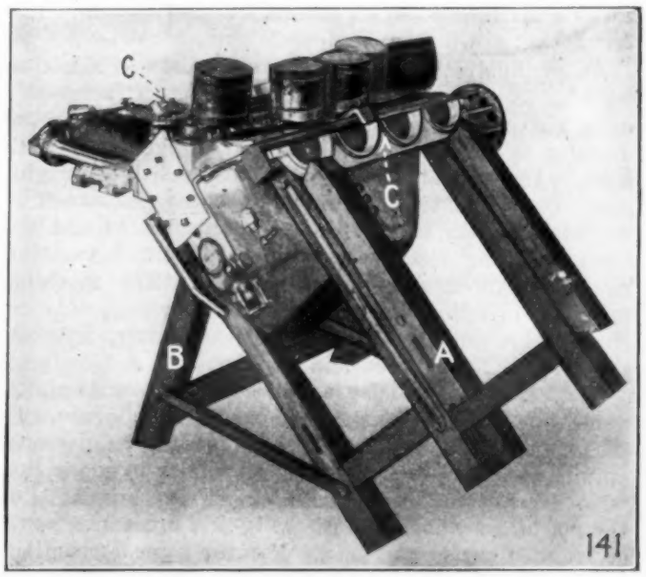


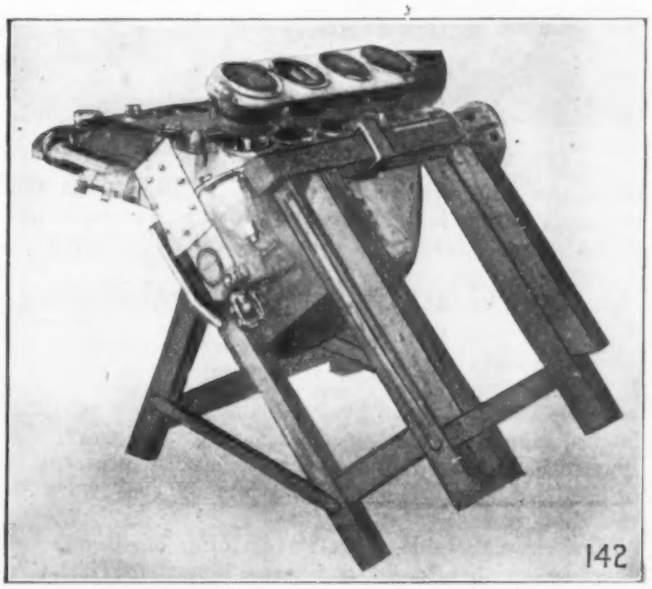
FIG. 139. LAPPING PISTON RINGS

Assembling Operations

The crankshaft, connecting-rods, propeller hub and ball bearings are assembled as a unit and in this condition are shown in Fig. 140.

In assembling the pistons into the cylinders, the crank case containing the crankshaft unit is mounted on the tilting stand shown in Fig. 141. Swinging legs shown at *A*, and extended and braced at *B*, permit the stand to be tilted to an angle of 45 deg. each side of the center, thus bringing either set of pistons to a vertical position at will. As the cylinders in the block must be placed over the pistons, it is necessary that all the pistons be held in alignment and at the proper distance apart. For this purpose and also to hold the





FIGS. 141 AND 142. STANDS AND CLAMPS FOR ASSEMBLING CYLINDER BLOCKS TO CRANK CASES

AUTOMOTIVE CONSTRUCTION

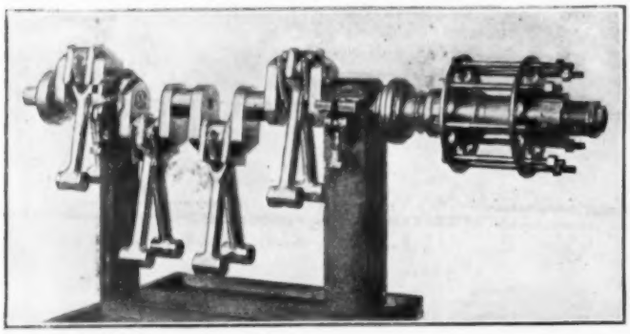


FIG. 140. CRANKSHAFT WITH ASSEMBLED PARTS

rings in compression the clamps *C* are used. In Fig. 142 these clamps are shown in place. After the pistons have been entered in the cylinders the clamps are slacked sufficiently so they will be pushed down the pistons by the weight of the block of cylinders.

For any special inspection of crankshaft or connecting-rod bearings, the engine is mounted on the rotating frame shown in Fig. 143 and clamped to the struts *A* that represent the bedplate on which it will be finally

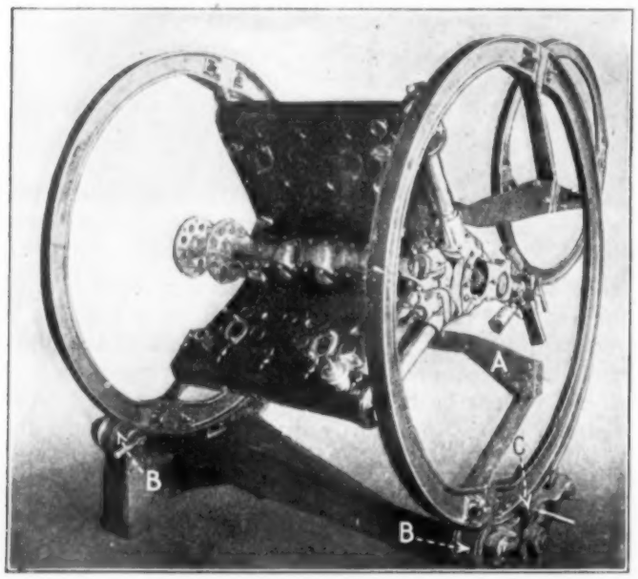


FIG. 143. A ROTATIVE INSPECTION DEVICE

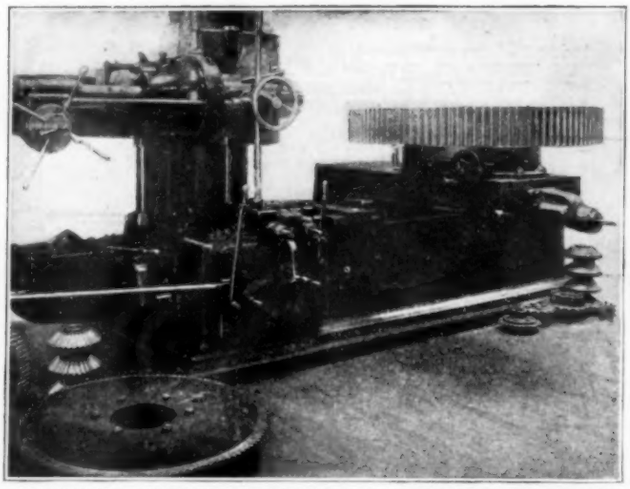
mounted. The whole arrangement is mounted on the rollers *B* so that it can be rotated to any convenient position where it may be held by the brake or clamp *C*.

Cutting Gears on a Horizontal Boring Machine

By Frank C. Hudson

While the horizontal boring machine is not particularly designed or recommended for cutting gears, the illustration shows how a Lucas machine attachment is utilized in handling quite a variety of gear work in the shop shown.

The circular table, with its dividing head, was secured from the Brown & Sharpe Manufacturing Co., and with it, gears and sprockets of various kinds are being cut as the necessity arises. The cast-steel spur



CUTTING GEARS ON HORIZONTAL BORING MACHINE

gear shown in position on the table is 51 in. in outside diameter, and has a 7-in. face and 1½-in. circular pitch. It is also stated that both the bevel gears and sprocket wheels shown on the floor have been cut with this same device. In cutting the bevel gears, it was, of course, necessary to incline the circular table to the proper angle by means of suitable blocking between it and the regular table of the machine itself.

A Question of Etymology

By Fred Price

On page 795 of the *American Machinist*, C. H. Norton says: "No American who understands the English language will permit himself to call a grinding machine a 'grinder.'" It appears to me that this is purely a matter of opinion. If we must speak of a machine on which grinding is done as a grinding machine, then why not call a lathe a "turning machine"?

In designating machine tools we are wont to use names that are short, comprehensive and easy to pronounce. Probably this is why we do not use the term turning machine when we mean a lathe. However, short terms that are not euphonious are never used.

As an illustration: No mechanic speaks of a boring machine as a "borer"; a screw machine as a "screwer"; or a cutting-off machine as a "cut-offer." Drilling machine is usually shortened to "drill," generally with a prefix to designate the type, such as sensitive, upright, gang, etc. The term, grinding machine, is correct if we wish to use it. So is it permissible to use the terms, planing machine, shaping machine, keyseating machine, cam-cutting machine, gear-cutting machine, internal grinding machine, etc. However, planer, shaper, keyseater, cam cutter, gear cutter, internal grinder, etc., are short and explicit.

What expression to use is a matter of personal opinion upon which current usage often exerts an influence. To illustrate: It is perfectly proper, so far as personal opinion goes, to use a carpenter's hammer in connection with a cold chisel when doing a job of chipping, but the machinist who would resort to this procedure would be laughed out of the shop. For the same reason, the average mechanic does not habitually use shop expressions that strike the ear as being out of place.

The Use of Trade-Marks—II

BY CHESLA C. SHERLOCK

Having learned what constitutes improper trade-mark subject matter, the next question is as to what does constitute proper matter? Also when will a manufacturer with a legal or an illegal trade-mark be protected by the courts from unfair competition? And just what is the legal definition of "unfair competition?"

IN THE previous discussion we found that any word or combination of words, when used in a trade-mark, which are descriptive of the quality, characteristics or ingredients of the article to which they relate, are not the subject matter of a trade-mark.

It would seem then that any word, combination of words, symbol or device which was not descriptive of the quality, characteristics or ingredients of the article under which the trade-mark is sold would be the subject matter of a trade-mark which would stand the test of the courts.

This is in a great measure true, with some exceptions. In the first place, no word, device or symbol can be the subject matter of a proper trade-mark which has been used by a competitor in the same line of business in the same way. This is to say that no one can adopt the same word or combination of words for his trade-mark which has been adopted by another.

In fact, it is not necessary to actually adopt the same word or the same device in order to become guilty of unfair competition. If there is a marked similarity between the two marks which might deceive the purchaser, then the mark is not proper even though it be entirely nondescriptive in character.

In this connection, it is necessary to point out an error made by many manufacturers in their consideration of the legality of a trade-mark. The mere acceptance and registration of a mark by the proper authorities does not announce to the world that it is absolutely legal in every way and not subject to legal attack. This is not true in the case of trade-marks any more than it is true in the case of patents. Court action or judicial interpretation is the only sure and safe criterion to follow and no manufacturer is absolutely given a clean bill of health in this respect until he has the opinion of the courts on the matter.

ILLEGAL PRACTICES

There is another fallacy which is quite generally used to deceive people in respect to trade-marks. Many business firms adopt a device or symbol which they have copyrighted, and then use it in their business in the same way that a trade-mark is used, containing this inscription, or one similar to it: "Trade-mark. Copyrighted U. S. Patent Office" or "Reg. U. S. Patent Office." Still others are merely "Trade-marks. Copyrighted."

In such instances, there is nearly always something wrong. A trade-mark actually registered in the Patent Office is not copyrighted and need not be copyrighted. What has generally taken place is that the device is merely copyrighted and the user has sought to scare off imitators by conveying the impression that the mark is properly registered. The reason back of this is that it is much cheaper and easier to obtain a copyright than it is to register a trade-mark in the proper way.

But the manufacturer or business man who indulges in these tricky methods is merely building his house upon quicksand and would undoubtedly be as well off, if not better, if he had never attempted the adoption of a trade-mark of any sort. It is useless to spend time and money in building up a trade-mark or device to the point where it has value and then have it all swept away because improper methods were adopted in the beginning.

The courts have given very careful consideration to the subject of trade-marks; in fact, nearly as many decisions are found involving them as in any other particular field of business endeavor.

The courts have said that certain words were the proper subject matter of trade-marks because they were nondescriptive of the quality, characteristics or ingredients of the article which they represented. (Note. Improper words or combinations were given in the previous discussion.)

Among these are the following:

Anchor Brand—a wire
Anti-Washer—a soap
Argyrol—an antiseptic
Baco Cura—tobacco cure
Beats All—a lead pencil
Beaverine—boots
Black Diamond—scythe stones
Brownie—a kodak
Cedarine—a furniture polish
Ceresota—flour
Charter Oak—stoves
Coca-Cola—a beverage
Comfort—a magazine
Cream—a baking powder
Cuticura—a soap
Elastic—bookcases
Eureka—fire hose
Eureka—fertilizer
Eureka—pressboards, steam packing, felt pads
Excelsior—stepladders
Gold Dust
Grape Nuts
Holeproof
Hump—hairpins
Hurricane—lantern
Invigorator—spring bed bottom
Kodak
Linoleum
Parabola—needles
President—suspenders
Prest-O-Lite
Primus—stoves
Royal—baking powder
Sapolio—soap
Savory—roasting pans
Sunlight—soap
Sunshine—stoves
Tachtype—composing machine
Wear Ever—aluminum ware
White House—coffee
Yusea—Gas mantle

It is, of course, hard to understand why some of these words or combination of words were accepted by the courts and others rejected as contained in the previous list. It is hard to understand, for instance, why Baco Cura is not descriptive of the quality or characteristics of the article sold. It naturally occurs to even the casual reader that the article is intended to cure the tobacco habit.

Likewise, it is hard to understand why Wear Ever is not extremely characteristic of the aluminum ware under which it is used, but the courts evidently do not think so. This only points out the great need for care and patience in selecting the words or combination which it is proposed to use in the trade-mark.

The primary purpose of trade-marks is, of course, to prevent unfair competition. It naturally follows then that even though a trade-mark used was not properly the subject matter of a trade-mark but has established a secondary meaning in the mind of the public,

competitors will not be allowed to use a similar device to deceive the public.

This is one of the most important exceptions to the general rule. Even though a trade-mark was faulty in the beginning and might have been assailed then, if it has through long-continued usage acquired in the mind of the public a secondary meaning, the courts will not permit competitors to copy it and attempt to deceive the public even though the trade-mark is not legally correct. This is to prevent what is called "unfair competition," a term greatly misused and misunderstood.

As a concrete example, let us suppose that the word "kodak" is not properly the subject matter of a trade-mark because it is descriptive (although this is not true) and that at the present time a competitor finds this fact out and attempts to use the word "kodak" in his business. The courts would say that the long usage of the word "kodak" had given it a secondary meaning in the minds of the buying public as representing high-grade cameras and that even though faulty in the beginning, the original user of the term would be protected.

In a Federal case it was expressly held that a competitor will not be permitted to use a descriptive phrase or mark previously adopted by another to designate the same character of article, in such a way, by trade dress or otherwise, as to deceive, or be capable of deceiving, the public as to the origin, manufacture or ownership of the article.

In a Missouri case, the court added that particularly when there is a general resemblance to descriptive phrases and the manner of their use, and dress of goods by a competitor, may indicate the similarity was the result of design, and show unfair competition.

In another Federal case, it was held that unnecessary simulation of nonessential parts of an article not entitled to protection under the patent laws constitutes unfair competition where the descriptive term is also simulated.

In still another Federal case, it was held that unfair competition is sufficiently established where it appears that a subsequent user attempted to subordinate the dissimilarities in the appearance of his product, and intended purchasers to be deceived by the similarities between his product and the product of the original user of the term.

Hence, we find that even though the courts have held that the term "shredded whole wheat" is not properly the subject matter of a trade-mark, yet because of long usage it has acquired secondary meaning and no competitor would be permitted to use the same combination of words because it would amount to unfair competition.

Court Protection

The real question then arising in the mind of the manufacturer who, unfortunately, has made an error in selecting the combination of words or the device used so that they are not properly the subject matter of a trade-mark is, When will the protection of the courts be afforded against unfair competition and when will that protection be denied? It is obvious that when the protection is afforded the manufacturer is practically as well off as if he had a perfectly legal trade-mark.

The protection of the courts is afforded those who have used descriptive words in their trade-marks when, through the long-continued usage of such words, device or combination, such words have acquired a secondary meaning in the mind of the public. There are cases, however, when protection will not be afforded and those instances are of peculiar interest to all manufacturers. It has been repeatedly held that the mere use of the same word or phrase does not constitute unfair competition in itself, so long as the user does not attempt to connect himself with the article as its producer, nor use unnecessary simulation to pass off his goods as those of the original user.

In other words, in order for unfair competition to exist in the use of trade-marks there must be actual or constructive intent to imitate the device or symbol of the original user for the express purpose of posing as the original maker of the original goods. This intent may be constructive or presumptive and arise from a marked similarity of the two devices so that it would readily appear to the average person that an actual attempt had been made to create such a similarity as to deceive the public.

In order for unfair competition to exist, then, it is absolutely necessary that the use of the infringing device be in a manner intended to deceive persons as to the origin of the goods.

If a competitor connects his own name to his own goods, no unfair competition has resulted even though it may be true that he has imitated the device of another and may even pack his goods in packages which are similar to those used by the original user.

We have found then in the consideration of trade-marks the following facts:

1. That words, symbols or devices which are descriptive of the quality, characteristics or ingredients of the article under which it is sold, are not the subject matter of a trade-mark.
2. That a manufacturer will be protected in his use of a descriptive word or symbol when it has acquired a secondary meaning to the public.
3. That a manufacturer will be protected against imitation of his device when the use is shown to be in a manner calculated to deceive the public as to the origin of the article.

Construction of Water Tanks Used in Army Ambulance Trains

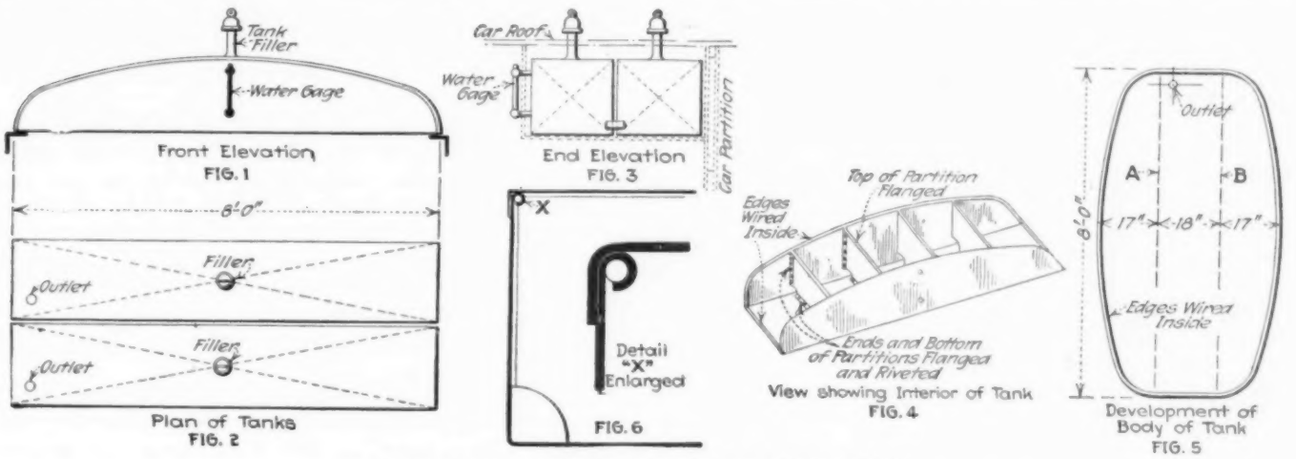
By E. Andrews

During the war a considerable number of ambulance trains were supplied by the railway companies of England for use on the continent. A special subcommittee, known as "The Ambulance Trains for the Continent Subcommittee," was appointed, and this body made all arrangements regarding design, equipment, transportation, etc., in conjunction with military representatives for the British and the United States armies.

Before these trains were shipped to the continent there was an opportunity for a few of them to be exhibited to the public on different railway lines. Generally a small charge was made for the benefit of the Red Cross or local hospitals in the various places, and in this way handsome sums were realized and handed over to provide comforts for the wounded.

Articles have appeared in a few technical journals on the construction of these trains, but so far I have seen no mention of the construction of the water tanks used either in the British or United States ambulance trains, notwithstanding the fact that the water prob-

lem has been one of the marvels of the war, the medical and sanitary authorities having achieved wonders in this respect. Every water supply in the zone of the armies, from the big rivers to the smallest village well, was frequently sampled and tested, and if believed to be doubtful they were chemically purified. Though only a detail in the vast organization behind the fighting line, the supply of pure drinking water both for troops in the field and the wounded on ambulance trains is vitally important to health and comfort. Indeed it is an interesting example of the magnificent thoroughness with which the needs of the British and American armies were supplied.



FIGS. 1 TO 6. CONSTRUCTION OF ROOF TANK

Fig. 1—Side view of tank. Fig. 2—Plan of tank. Fig. 3—End elevation of tank. Fig. 4—The partitions. Fig. 5—Development of body. Fig. 6—How the edges are wired.

An ambulance train comprises 16 bogie coaches and its total length is 959 ft., exclusive of engine and tender. Unloaded the train weighs about 440 tons and has accommodation for 420 persons or, if of "sitting-up" cases, a total of 650. An ample supply of water is carried on each coach, the quantity for the train being approximately 3300 gallons.

In Figs. 1, 2 and 3 are shown the front elevation, end elevation and plan of reservoir water tanks, 38 of this type being suitably distributed throughout the train. Thirty-six were made 1 ft. 6 in. wide, with a capacity of 80 gal. each, and two were 2 ft. wide, giving a capacity of 106⅔ gal. each. The tanks were constructed from semiannealed copper sheets 0.0625 in. in thickness, weighing 2.89 lb. per square foot.

The main point in favor of copper for water-tank construction is its durability. On the other hand, when exposed to a damp atmosphere copper quickly forms a poisonous verdigris, to safeguard against which the inside surfaces were carefully coated with pure tin. By this means the water is rendered free from contamination, is delivered at the respective places quite pure and may be used for cooking or drinking as well as for bathing or cleaning.

Each tank consists of six pieces of sheet copper, one for the body (Fig. 5), four for the partitions (Fig. 4) and one for the top. After the pieces are cut to the required shape and dimensions the body piece is bent at right angles on lines *A* and *B*, Fig. 5, in an angle-bending machine. The edges are then suitably bent over for wiring with a $\frac{3}{16}$-in. diameter tinned brass rod, as shown by Fig. 6. This wiring strengthens considerably the tank body.

The partitions are then made and fixed by riveting with No. 7 S. W. G. (0.176-in.) by ½-in. flat-head copper rivets spaced 2 in. apart. Partitions are necessary not only for strengthening but to act as breakers, which they do effectively by intercepting the force of the water when it is swayed to and fro by the movement of the train at high speed. Holes are cut to suit the outlets and water-gage fittings, and these are soldered in position.

The top edges of the tanks are flanged at right angles, the top being bent to the required contour. The filler screw flange is riveted on the top before it is fixed to the tank body. The tanks are made tight by soft soldering, a solder composed of 50 parts tin and 50 parts lead being employed. In Fig. 3 it will be noticed that the tanks are arranged in pairs with the water fittings suitably connected. The main reason for this is to facilitate handling when fixing the tanks in position and taking them down when repairs are required. Repairs, however, have been seldom needed, as thorough tests are made before the tanks are fixed in the car roofs.

The tanks are totally inclosed within wood casings and these are usually white enameled. The words "water level" are painted in black close to the glass water gage. A sheet lead washer is attached to the filler fitting and is fixed on the car roof, copper nails and white lead paint being employed to effect a tight job. Lastly a piece of iron chain 10 in. long is fastened to the filler cap and to the car roof to prevent the cap from rolling off and becoming lost when filling the tanks. A number of overhead water pipes were erected at certain loading stations to facilitate the filling of the tanks. These are situated directly over the tracks and extend the whole length of the train. Each pipe has a brass cock fitted with a short length of hose, which is necessary to direct the flow of water to the filler orifice.

Figs. 7 and 8 show the front elevation and plan of a cylindrical tank with a capacity of 6½ gal. Seventeen of these are fixed in convenient positions in the train and used solely for carrying drinking water. For obvious reasons provision is made for both tap and lid to be padlocked. These tanks were made of No. 18 S. W. G. (0.048 in.) tinned copper sheets weighing 2.25 lb. per square foot. The body *A* was cut 2 ft. 11½ in. by 1 ft. 7½ in., which gave the required dimensions after allowances had been made for the grooved joint.

For a joint of this type the edges of the metal are bent over in opposite directions and when the cylinder is formed the edges are hooked together, the joint being made by hammering down the folded edges with a suitable groover on an iron bench tool. An angle-shaped ring of copper is made and soldered to the top of the body for the lid to rest on. The bottom band *B* is made of $\frac{3}{4}$-in. by $\frac{5}{32}$-in. wrought iron, joined by oxy-acetylene welding, then tinned and soldered to the

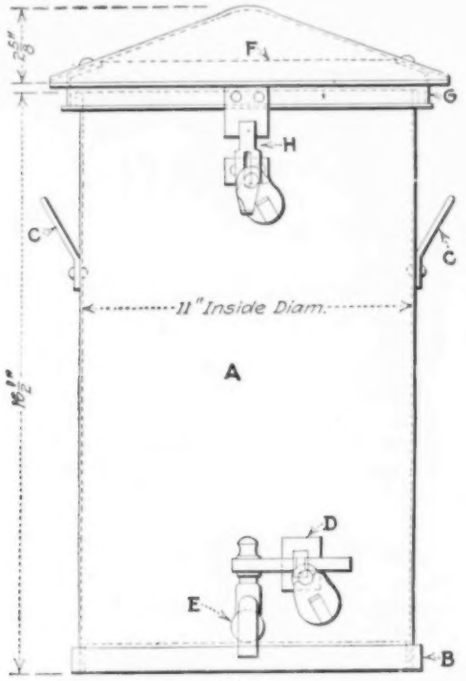


FIG. 7

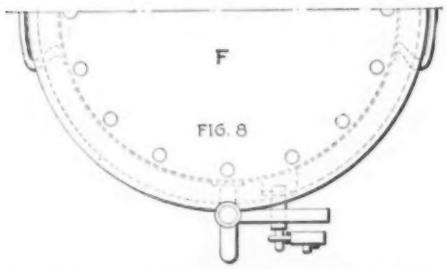


FIG. 8

FIGS. 7 AND 8. DRINKING-WATER TANK
Fig. 7—Elevation. Fig. 8—Plan

body. The side handles *C* are cast brass, riveted and soldered to the body. The fitting *D* and the bibcock *E* are also soldered to the body. The fitting *D* is of cast brass consisting of a hinged arrangement with two semicircular parts to grip the lever handle. Suitable holes are drilled for padlocks.

The cover *F* is cut 14¼ in. in diameter. As a considerable number were required the writer designed cast-iron dies with which they were stamped to the required shape in a double-arm screw press. The edge is bent over, flattened down and creased. The top rim *G* is made an obtuse angle shape to fit the cover and is riveted to place. The hinges and hasp *H* are then fastened in position by riveting and soldering. A leather strap fixed round the tank and to the side of the car keeps it in position while the train is in motion.

Two ordinary wrought-iron, close-top, hot-water tanks about 2 ft. square, with a capacity of 50 gal. each, are provided in the kitchen sections. In addition to the above a Soyer stove or boiler is fitted in the two kitchens capable of heating copious supplies of water for washing and cleaning purposes.

Copying Products or Methods

By I. B. Rich

When we talk about copying we are treading on dangerous ground, and most of us prefer to call it "adapting." It sounds better and eases what little conscience we may have left after years, too numerous to mention, in the machine business. But when we get away all by our lonesome, where we can be half way honest with ourselves, we must admit that the really original man is such a scarce article that few of us have ever seen one.

This doesn't mean that we are all crooks or that we bodily appropriate all our ideas from the other fellow, as this is evidently impossible; but we do get suggestions, sometimes unconsciously but more often not, which we utilize in our own work. Just how far we are dependent on the work of others, perhaps centuries ago, is difficult to determine, but when we see the ideas which were recorded by Da Vinci and others, we must admit that the real germ of most things dates pretty far back.

Just suppose that every machine designer really owned up as to where he got the first notion of a new machine, as to how the idea took shape and to what extent previous machines had furnished direct suggestions! What a lot of confessing we'd all be doing.

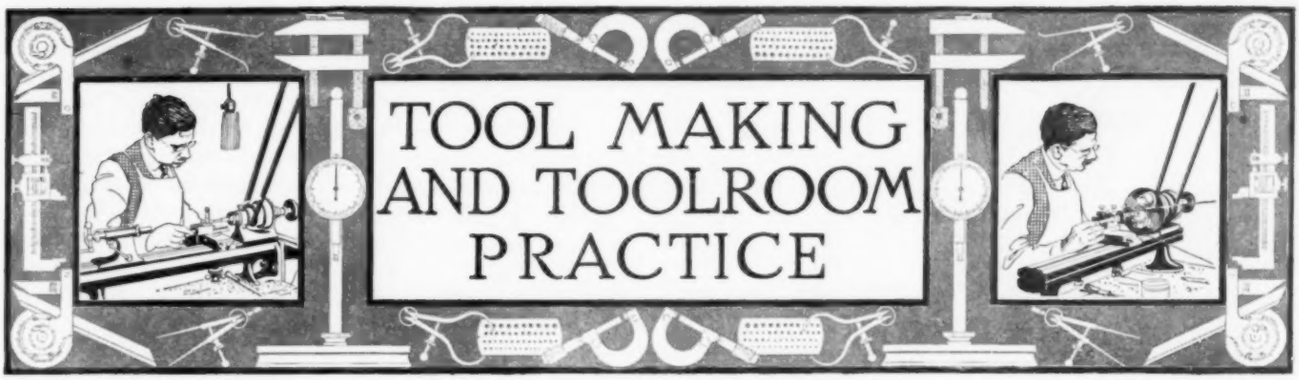
Then on the other hand take a look at shop methods which some of us try to guard so carefully lest the other fellow copy them. True, most of us have outgrown this form of foolishness but it still clings in the corners and affords a pretense, in some places, for keeping visitors out.

I'm quite sure, however, that we all do more copying of product than we do of method, even when the former is covered by patent and the latter is not. For, if we segregated the draftsmen and designers whose main occupation is to "get around" the other fellow's patent, we'd have a nice little colony to start a new country.

This fear that everyone is waiting to copy our methods of doing work, has far less foundation than that our product will be copied by our loving friends in the same line. We all have quite a bunch of pride about our ability to devise ways and means of doing work and we are very slow to admit the other fellow's way is any better. Furthermore, we have a lot of money invested in tools and fixtures for our own method and we cannot afford to change unless the savings are enough to pay for abandoning our investment as well as perhaps duplicating it in a new lot of tools and fixtures.

Does this not all go to show that we overestimate the danger of loss from one source and underrate it in the other? Perhaps this is because we can in a small degree guard the method, while the product is open to attack the moment it appears on the market. But when we count the advantages we gain by getting suggestions from the shop visitor, and view the chance of loss at its proper figure (which is very small indeed), we see that we have expended much needless worry over the whole situation.

Is it worth while to remain in the rapidly diminishing list of closed shops, when even the greatest possible advantage is so very doubtful?



Elements of Gage Making—VIII*

By C. A. MACREADY

Knife-edge squares and straight-edges are necessary for good gage making. It is practically impossible to use the ordinary beam square to prove a right-angle, or a scale to prove a flat surface. The removal of the excess stock that creates an error in a plane or a right-angle, is very quickly accomplished if the error is truthfully located. Most machinists who use the beam square and scale have noticed that they have to be placed in a certain position to prove the work to be square, or flat.

THE squares *A*, *B*, *C* and *D*, Fig. 109, can be placed in contact with the surface to be tested and no attention need be given to placing them in a certain position. When they are properly made they can be tilted so the blade is at an angle other than perpendicular to the surface plate and still prove the surface being tested for squareness vertically, or they can be used with the blade at an angle to the work. This feature can be taken advantage of by placing the square in a position that will shade the inside edge. The light can thus be concentrated on the edge being used. The block squares *A* and *B* will give a more perfect test for a right-angle than the inside edge of *C* as the work is generally placed upon a surface plate when the block squares are used. This of course makes a full surface contact test of the surface plate and work. The knife edge being used on the lapped vertical surface of the work will show the error if there is any. The square shown at *D* is one with the blade cut out to avoid an obstruction that will not permit an ordinary square to be used.

Such squares being of a temporary nature are left soft. They are proved by the square standards described in Fig. 101. The small block square *B* is made of a rectangular piece of hardened steel of a size suitable for the work to be tested. Different sizes of these small squares make very handy tools for places that usually can not be tested. All of these squares are checked from time to time with the double-angle iron used to demonstrate accuracy when lapping as described in connection with Fig. 100.

The bottom of the square is placed against one face of the lapping fixture (the double-angle iron) and is given a sweeping motion over the face of the lap, at the same time the square is rolled about 30 deg. each side of the center while the edge is pressing against the lap. This gives a rounding edge that will give practically a line contact with the work. The knife-edge square *C* is a very handy square, as the inside edge can be used to test work which the block square *A* will not check.

The inside edge of the square *C* is trued up on a cast-iron piece which is a right-angle large enough to allow the body of the square to be rotated. A piece of tissue paper is placed between the body of the square and the cast-iron block when the square is being rough-lapped. A firm contact must be had with the face of the block, a light pressure being applied to the blade, or it will not be lapped at the right place. Before giving the rotary motion to round the edge, the blade should be lapped slightly flat at an angle of about 30 deg. on both sides and the front edge should also be lapped square and flat. When these surfaces show true then they can be given the rounded edge that is desirable by using the rolling motion described. The outside edge of the square *C* is trued in the same manner as the block squares.

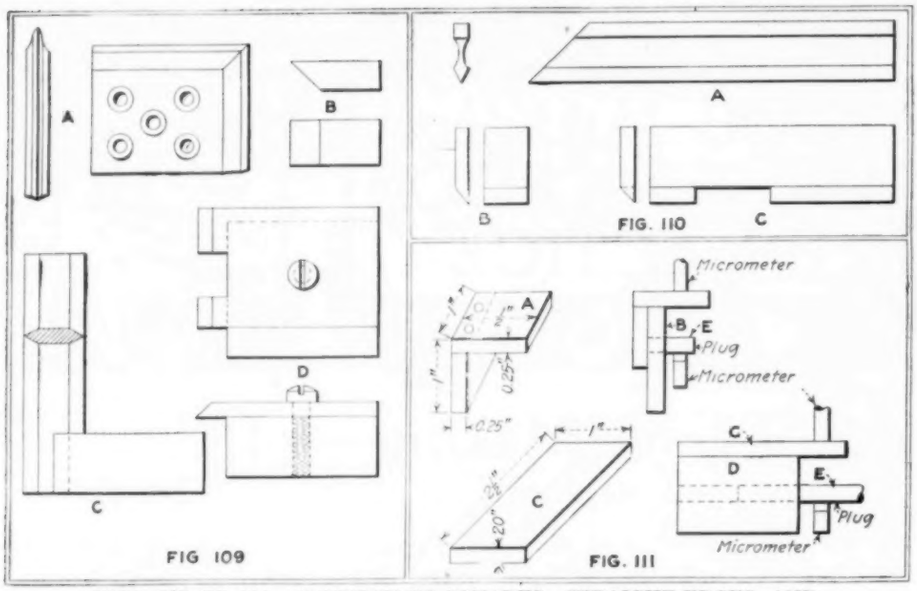
Knife-Edge Straight-Edges

Straight-edges such as shown at *A* in Fig. 110 are made in several different lengths. The one shown at *B* is a small one for use in narrow slots. It is made of "flat ground stock" and filed to an edge before lapping. Such straight-edges are quickly made and will prove a surface within their length better than pigments used as "marking" on a plane surface. The straight-edge shown at *C* is cut out to bridge an obstruction in the same manner as the knife-edge square *D*, Fig. 109. Temporary ones are used in the soft state and trued as described when making a "proved lap."

All knife-edge straight-edges that are long enough to multiply the error caused by distortion and wear from use, should be tested often with a glass test bar which is a true plane to detect the error. Glass is one of the few materials which will not take a permanent set if distorted by the ordinary fluctuations of temperature. A glass test bar can also be used to test the surfaces of taper-plug gages and small plug gages which are long in comparison to their diameters.

The assembled small angle iron *A* in Fig. 111 is a

*Prepared for the Author's forthcoming book, "Elements of Gage Making."



FIGS. 109 TO 111. KNIFE-EDGE SQUARES, STRAIGHT-EDGES AND ANGLE IRON AND TEST PLATES

very handy tool to measure over a plug in an accurately located hole. It is used on thin work as at *B* where the controlling surface is too small to locate the piece properly while it is being measured. The rectangular plate *C* is used where the controlling surface has area enough to locate it properly while measuring over the plug *E* and plate *C*, as at *D*. The plate *C* should be made of such thickness that it will be a simple mental operation to subtract its dimension from the over-all measurement taken. The sizes given in Fig. 111 will be found to cover a wide range of requirements.

A Handy Height Micrometer

The height micrometer illustrated in Fig. 112 is a measuring instrument which will be found very handy to use and not very difficult to make. It is adapted to making various measurements both of length and depth which are often found awkward to make with the regulation vernier height gages. It also has an advantage over the vernier height gage which makes it invaluable, that of being able to measure a fraction of a thousandth of an inch. With a set of accurate templets the checking of the measurements on gages and templets is easily and accurately accomplished. The illustration shows its general construction. A little explanation will make plain the coil spring *E*, screw *F* and the slots *G* and *H* in the extension arm *B*. The dimensions given are taken from an instrument that has given good satisfaction.

The coil spring *E* is made of No. 52 drill rod and is hardened and drawn to a stiff spring temper. It is a free sliding fit over the stationary stud *C*, which is 0.45 in. in diameter. The spring is soldered on an arbor, then ground until it is a free sliding fit in the $\frac{9}{16}$-in. counterbored hole. Three or four coils of the spring extending out for compression will be sufficient to keep the sliding sleeve *D* in firm contact with the adjusting screw *A*. The screw *F* has a tapered body that impinges on the shell of the micrometer head. The screw should be a free fit in its hole when the micrometer head is not in the arm *B*. When drilling the tap-size hole for the screw *F*, the micrometer head should be in position upon the surface of *B*. The spot made by the drill on the shell marks the location of a groove which is now turned in the micrometer shell. This groove should be large enough to allow the body of the screw to seat in it. With this means for turning and clamping the micrometer head as a whole, the zero line can be located by the operator so it can be read from the side which is most convenient for him or the best lighted. As the screw is known to be free when the micrometer head is not in position, its pressure on the micrometer shell can be so regulated that it will hold the micrometer shell without pinching the measuring spindle.

The slot *G* in *B"* is made $\frac{1}{16}$ in. wide with a saw $2\frac{1}{2}$ in. in diameter. The saw is dropped in until it breaks through the shell leaving about $\frac{3}{32}$ in. solid on each end of *B"*. The slots *H* are cut close to the lug by means of a hacksaw. This forms a clamp that pinches *D*, without distorting *B*. The binding screw for this clamp, not shown, is the same as at *A*. The sliding sleeve D is made out of an old 0.45 calibre rifle barrel turned down to 0.625 in. in diameter, but a good drawn tube reamed true will work all right. There is very little upward or end movement required of *D*, merely enough, when regulated by the screw *A*, to make the micrometer read at the desired point on its scale. This will not always be at zero. Often when adjusting the head *B*, a half of the diameter of the plug is allowed for when the micrometer is set; that is, the plug might

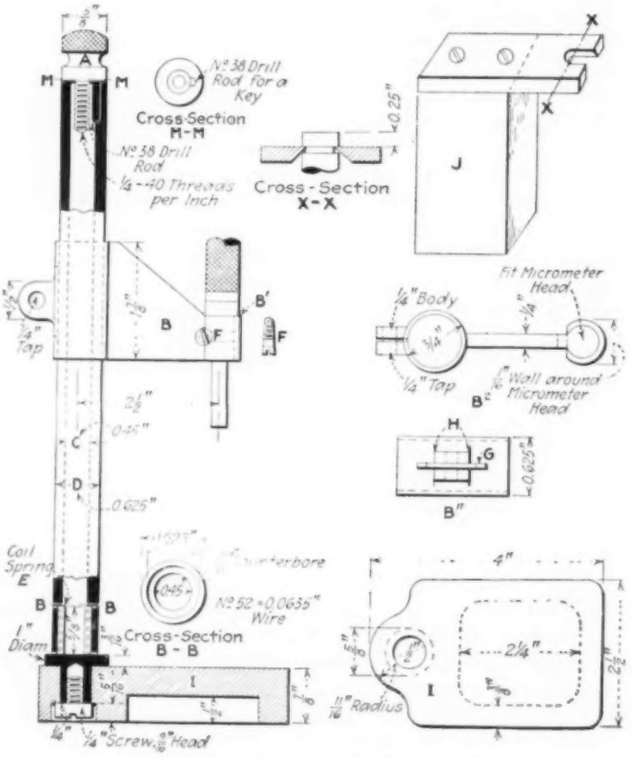


FIG. 112. HEIGHT MICROMETER

be 0.500 in. and the measurements given from the center of the plug; setting the micrometer to read 0.25 in. from the top surface of the plug will be the equivalent of measuring from the center of the plug.

The extension arm *B* swings in a complete circle which allows it to be placed in the most advantageous position when measuring. By releasing the screw *F* the scale can be adjusted to be read to the best advantage. The cross-section *MM* shows the key which keeps the sleeve *D* from turning. The drill-rod key should be a good fit but not tight enough to keep the sleeve from responding to the adjusting screw *A*. This gage can be used for comparing thread plug gages by the "three-wire" system, the wires when used upon the base *I* which is a true plane at right-angles to the micrometer spindle, adjust themselves to the angles. This gage is used as a comparator. When heavy gages are being measured the wires wedge to a certain extent. In other words they are not merely in contact but are forced more or less between the angular sides of the threads depending on the hardness of the gage, its weight, and the angle of the thread; but on small light plug gages there is little of this action.

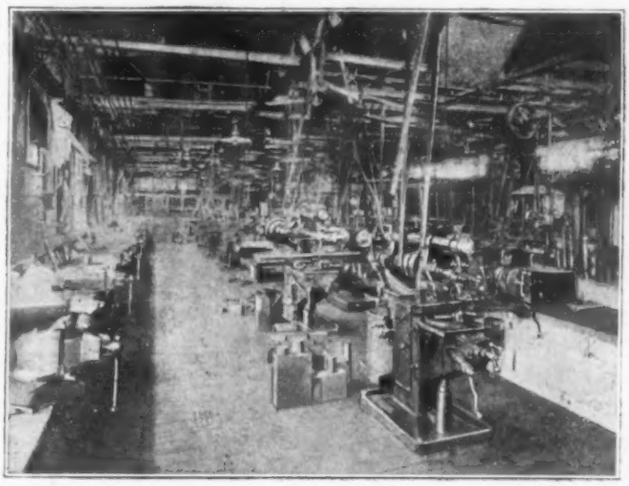
Another use is in setting work, when on centers, central with the axis of the milling-machine spindle, by measuring from a true plug in the spindle. The auxiliary anvil *J* can be designed to take work that is often awkward to measure accurately. The cross-section *XX* shows one that is used in a narrow circular slot in a cartridge head. With the use of end-measuring templets, it will measure 8½ in. in length and 4 in. in diameter. Using the surface plate to measure from will increase the length that can be measured to 9½ in.

A Modern Railway Toolroom*

By E. J. McKernan

The illustration shows a part of the Topeka toolroom of the Santa Fé Railway, where all of the tools are made and distributed to outside points of the system. The tool-tempering department is connected with the toolroom, but could not be shown in the same view. In order to obtain proper results in the railway system it has been found essential that all tools be standardized wherever possible, and drawings are made of all tools so that they will be made according to the standards adopted. It has been further found advisable to make only such tools in the toolroom that cannot be secured from the manufacturer for a reasonable price. We do not consider it good practice for a railroad shop toolroom to manufacture tools that can be secured from manufacturers for the same price or less than it would cost to make them locally. Many railroad shops make such tools, but I consider it false economy due to the fact that there is a certain amount of loss incurred by the toolroom, and when standard tools are secured from the factory all the possibility of loss is overcome due to the fact that all tools so furnished are guaranteed to be in first-class condition and free from flaws and defects.

At this day and age we must get rid of individual ideas and adopt practices that will give better efficiency, reduce the cost of output and, on the other hand, simplify the tool situation wherever possible. It has been plainly shown that the adoption of standard practices of the Railway Master Mechanics' Association was a good thing. When it adopts a standard, it is carried out to the letter and considered standard on all railroads. I am sorry to say that in the past eight years of the American Railway Tool Foremen's Association, some members who have attended meeting after meeting have personally told me that, when they returned to their homes and made their reports to their local officials, they did not get the cooperation they should have received. As the tool foremen who attend these conventions receive instructions to do so from their superiors, the latter should have sufficient confidence in their men when they receive a report that a certain tool has met the approval of this association and been adopted as a standard, that an effort should be put forth to standardize on that tool.



TOPEKA TOOLROOM OF THE SANTA FÉ RAILWAY

If we could standardize the tool equipment on all of our American railroads and use the same methods and practices, there is no question but that we could eliminate a great deal of making of unnecessary tools. I appreciate the fact that toolroom foremen and superintendents of motive power have a certain pride in the making of all tools for their respective railroads, but the progressive man of today will not follow this to extremes. If we refer to the automobile industry where all parts must be interchangeable, we find that their first thought is to get all tools made to a standard before starting production, and these tools are maintained to an extreme standard of accuracy. If this is good practice from a manufacturing standpoint, why is it not a good practice in the railroad shop?

*From a paper presented at the Chicago meeting of the American Railway Tool Foremen's Association.

Standardized Partitions for the Quick Shifting of Departments

By P. F. O'Shea

All partitions for tool cribs, stockrooms and factory offices in the plant of the American Bosch Magneto Co., Springfield, Mass., are composed of standardized sections. Each section is 8 ft. long and either half, or the whole height of the partition, from floor to ceiling. If a complete partition from floor to ceiling is desired, two sections are placed one on top of the other. When a new office or crib is to be partitioned off, the dimensions are made multiples of the section lengths, and as many sections are placed end to end as are needed to form a

side. Such rooms are usually laid out with one corner coinciding with a corner of the room or with another partition, thus making necessary only two partition walls instead of four.

Rooms which have to be large are laid out much longer than they are wide, stretching along one wall of the building. This gives good light from the windows along that side. These inner rooms are allowed to jut out to within four feet of the center line of the big room they are in. The light from the windows on the opposite side of the room will penetrate well to four or five feet beyond the center line. Good lighting on both sides of the partition is therefore secured.

If offices or cribs are partitioned off on both sides of the big room, coming up to within four feet of the center on each side, the spacing automatically leaves an aisle, 8 ft. wide, down the middle of the room.

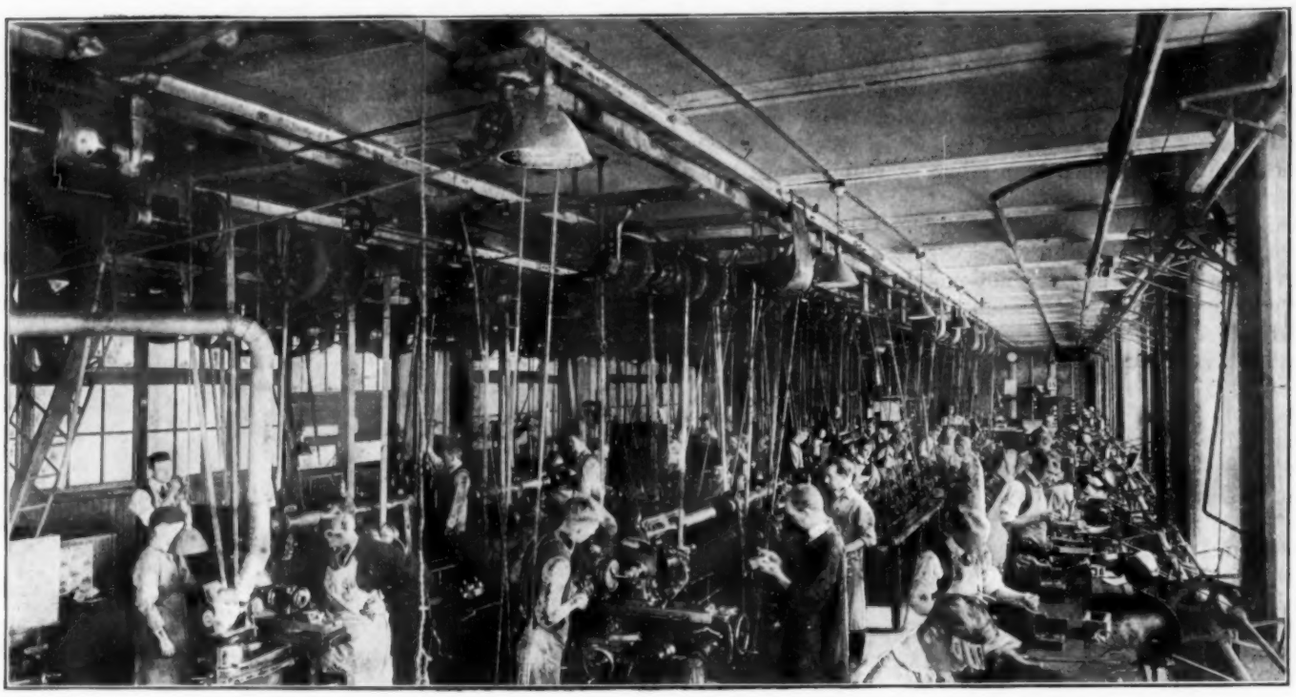
If the crib or office is to be moved to another location, as so often happens in a growing shop, the present partition can be taken down and assembled again in another place. If it is to be amalgamated with another inclosure the discarded sections can be sent to storage where they can be redrawn when wanted.

The sections are set on thin sills or furring strips to take up any inequalities, and secured by posts fastened against the wall or against the building columns at the sides. A strip of molding gives the proper finish to the joint between the sections. Removing the inclosure is simply a matter of taking off these strips of molding, removing the sections complete one by one, and ripping up the sill from the floor and the posts from the walls. Putting the inclosure together somewhere else is simply a matter of laying and fitting a new sill and post, and inserting the sections.

With these partitions inclosures can easily be moved to accommodate manufacturing departments. They are a great advantage when it comes to enlarging a department or a plant. Moving the partition sections does not injure them, as they are made very stout. The frame of each section is of 4 x 6-in., hardwood timber, and the sheathing is 2-in. matched hardwood.

A machine shop with offices on one side inclosed with standardized partitions may be seen in the illustration.

In this same shop the stringers for hanging the line-shaft and countershaft are channel irons and run the full length of the shop. These are bolted to other channel irons running crosswise of the shop and set in the concrete ceiling in such a way that their lower legs form T-slots. Thus the stringers may be placed on any part of the ceiling and at any distance apart. The hangers are bolted to short pieces of channel iron which are in turn bolted to the stringers. This convenient and flexible arrangement is shown in the illustration. By its use a new machine can be put in or an old one moved to another part of the shop without the necessity of putting up or taking down the stringers.



MACHINE SHOP SHOWING INCLOSURES ON ONE SIDE AND ARRANGEMENT FOR HANGING SHAFTING

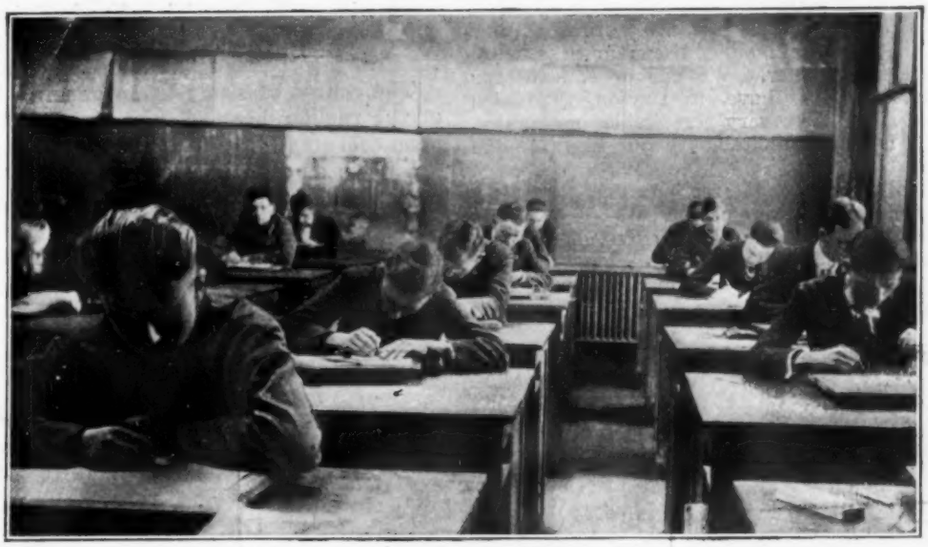
Removing Broken Taps

BY S. B. ROYAL

On page 795 of *American Machinist* Gilbert H. Calm outlines a method of removing broken taps by welding on a rod with the acetylene torch. Many small shops are not equipped with welding tools, and I will therefore describe a method that works well and can be easily applied anywhere.

Clean all grease and dirt out of the hole with gasoline; then put in the hole (a little at a time) a mixture of equal parts muriatic and sulphuric acids. The acid eats away a little of both the tap and the surrounding metal, thus loosening the tap and allowing it to be backed out.

If it is broken off below the surface of the hole, place in two opposite flutes of the tap, rods of the largest diameter possible. Grasp these two rods with a pair of pliers or a wrench and back out the broken tap. The hole should be well washed out with water to which a little soda or chalk has been added to neutralize any further action of the acid.



The Co-operative Industrial High School and the Part-Time Extension Trade School for Apprentices*

BY C. C. SHARKEY

How many manufacturers know about or are taking advantage of the provisions contained in the Smith-Hughes Act? This act provides for coöperation in vocational education between the Federal Government and the states, and if carried out according to the intention of its framers, will greatly help in the solution of the apprenticeship problem. That manufacturers in at least one part of the country are keenly alive to the benefits to be derived from this act and are working in conjunction with the School Board of their state in regard to it will be shown in this article.

SIX years ago through the activity and cooperation of John H. Patterson, E. A. Deeds, and the late Superintendent of Schools, E. J. Brown, the Coöperative Industrial High School, Dayton, Ohio, was established in connection with Stivers' High School. Since that date other cooperating manufacturers have been added to the list, until now 10 factories have apprentices working in accordance with the following plan.

In order to enter the coöperative school a boy must have completed two years of high-school work and have reached the age of sixteen. Through an extension of the school year from 10 to 12 months and of the school day from nine to eleven 45-min. periods, the boy who works a week and goes to school a week, alternately, during the last two years of high school is enabled to complete his high-school work as soon as if he had remained in the regular course.

When a boy desires to enter the coöperative school the principal assists him, if necessary, to locate in one of the coöperating factories. He is then given a preliminary trial of two months in the factory selected, during the regular summer school vacation period. If he exhibits capacity and adaptability for becoming a successful mechanic, he is permitted to enter the coöperative school in September. In every instance final decision as to what boys may enroll is made at a conference between an official of the factory concerned and a school representative.

The condition governing the amount of time the boy is to spend in each specific type of work in the factory and the scale of wages he is subject to, are stated in a contract which is signed by all parties. For convenience both to the factory and to the school, the boys are paired off in such a way that when one is in school his mate is in the factory, and vice versa.

Production, of course, is the primary object of the employer; consequently, any plan which sooner or later enables him to increase the factory output is to his advantage. The coöperative plan works to this end, since at the expiration of the two-year apprenticeship period the employer will have two employees well along in the course of training though he has had to look after but one at a time, and under ordinary conditions would, therefore, have had but one workman.

A more important advantage rests in the fact that the inquisitive attitude, without which no person advances far, is not only kept alive but is intentionally encouraged in the school. This makes stagnation improbable, if not impossible, in the apprentice.

The following excerpt from a letter of one Dayton manufacturer to another, whom he wished to interest in the coöperative plan, neatly summarized its advantages:

All the worth-while men in Dayton have high ideals for the city. These ideals find expression in various ways. No city problem is of greater importance than the welfare of our school system, and someone has well said:

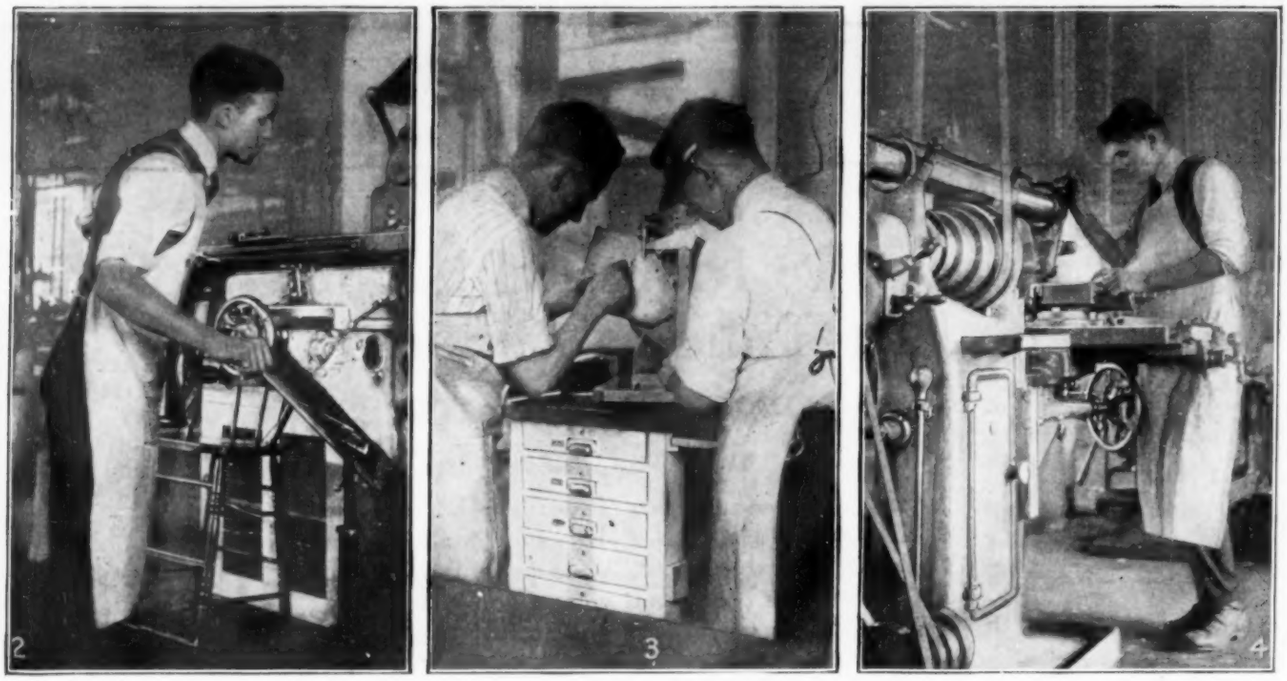
*Conducted by the Board of Education coöperating with an advisory committee of Dayton manufacturers under the Smith-Hughes Act for the promotion of vocational education.

"Whatever you desire in your city, put into your schools." . . . It is absolutely essential to the future of our mechanical city that we train our citizenship in a more practical and efficient manner. We cannot educate for work without working. We have, in Dayton, graduates from this school who are very creditable mechanics. . . . The work is most creditable to our city for the following reasons:

1. It makes school work more interesting.
2. It increases the ability of our people.
3. It keeps the boys in school until they graduate.
4. It betters the citizenship of our city.
5. It helps the smaller industries, which are unable to establish training schools of their own.

sends him to the Part-Time Trade Extension (Continuation) School one-half day per week on the factory's time during the last two years of his apprenticeship.

The course of study is, in general, the same as that of the regular high school. Special shop mathematics, shop coördination, and drawing and tool designing take the place of manual training, as the boys work alternating weeks in the factory. Furthermore, drawing and tool designing is required 10 periods per week. Science, English, history, civics, and mathematics consisting of algebra, geometry and trigonometry are taught in a way to make them as practical as possible.



AT WORK IN THE SHOP

Experience thus far has proved that the boys in the coöperative course advance more rapidly in industry than those who follow the regular high-school course to the end before entering industry. The close connection of theory and practice which the coöperative scheme accomplishes is undoubtedly responsible for the marked initiative, adaptability, and resourcefulness manifested by the boys. In addition, the plan which enables them to work and receive pay on alternate weeks makes it possible for many boys to complete the high-school course who could not otherwise do so.

The course of study, which is subject to change from year to year, is determined at a conference between the superintendent of schools and an advisory committee consisting of five manufacturers. This course, it should be noted, fully meets the college entrance requirements for an accredited high school.

After Completing High School

At the end of the coöperative high-school course a boy may either enter college or complete his apprenticeship in the factory. A large percentage of the boys from the coöperative school enter the Engineering Colleges of the Cincinnati University on the coöperative arrangement and continue at the factory where they were employed during their high-school course. Eight of last year's class (1918) entered the University of Cincinnati. If a boy does not go to college, the factory

The teachers for the latter subjects are from the regular school staff, while those for the shop mathematics, shop coördination, and drawing and tool designing are tradesmen who have had special training and have met the requirements of the State for Smith-Hughes work. These men come from the same trades as the apprentices; namely, machinist, toolmaking, tool designing and patternmaking.

The Part-Time Trade Extension (Continuation) School for Apprentices

The Dayton public schools, through the continuation school plan, offer to the industries of Dayton the opportunity of having their apprentices attend school one-half day per week for special industrial training, without cost to them or to their apprentices. The course as now organized and conducted consists of shop mathematics, mechanical drawing and tool designing especially as related to the metal trades. Other courses will be added as the need for them becomes apparent.

In the five years that the school has been in existence the number of coöperating firms has increased to 14, while the number of apprentices has reached more than 150.

Each apprentice reports to the school at 8 a.m. or at 1:30 p.m., on the half day to which he has been assigned, and attends classes. The time of his entering and leaving the school is reported on the same days to

the employer. Each boy is assigned to a particular half day at the school after the coördinator in charge and the factory officials have conferred on the matter. Factors which receive consideration in such conferences are: Avoidance of disruption in the factory organization because of too many apprentices being absent at one time; each boy's previous training and the length of apprenticeship already served; and facilities available at school for taking care of the apprentices.

The school is now organized so that apprentices with all degrees of preparation from that of graduation from the grades to graduation from the high school may be accommodated and an apprentice may enroll at any time. Moreover, the organization is flexible enough to allow transference of a boy from one section to another, if factory conditions necessitate it. Detailed reports of each boy's work are made monthly to the factory officials.

Its Advantages

The continuation school plan has many advantages, chief among them being that:

1. It enables the boy who is just entering upon his apprenticeship to adapt himself more readily and successfully to shop conditions.
2. Due to the close coördination of factory and school, the practical and theoretical phases of the trade are made mutually beneficial, thus assuring more rapid advancement for the apprentice and better service for his employer.
3. The apprentice is stimulated to give the best possible service by the knowledge that his employer is sufficiently interested in his welfare to desire and to encourage him to attend school one-half day per week.
4. It affords additional schooling of the most practical character for boys who, because of the necessity of helping bear the family expenses, must stop school at an early age.
5. It provides opportunity for more thoughtful direction of the apprentice than shop conditions ordinarily permit. The boy is not only taught to think and to act intelligently at times, but is materially assisted toward acquiring the habit of acting this way at all times. Intelligent compliance rather than blind or unthinking obedience tends to become the controlling ideal of his life.

Yet other advantages accruing to the employer are:

1. A relatively inexpensive and highly economical method of improving the quality of service received.
2. An appreciable improvement in the morale of the employees as a whole.
3. An excellent means for preparing capable supervising and instructional foremen, types of employees which the experience of the last few years has proved so necessary.

For these reasons, not to mention others equally important, the industries will find it to their interests as well as to the interests of the public to make use of the part-time trade extension school. The plan should appeal especially to smaller industrial firms who do not find it practicable, because of the high cost, to maintain schools for their apprentices.

Schedule of Classes

Morning sessions: Practical mechanical drawing and tool design, 8:00 to 9:45; coördination, 9:45 to 10:00; shop mathematics, 10:00 to 11:30. Afternoon sessions (same studies): 1:30 to 3:15; 3:15 to 3:30; 3:30 to 5:00.

The morning session begins at 8 o'clock. Boys may make use of the technical library prior to this hour. Some boys have more time than others before the regular schedule of school work begins, because the factories have different noon hours. It has been found advisable, therefore, to begin the afternoon sessions at 1:30. But regardless of how early the boys arrive they are under the supervision of an instructor in the technical library until class hour.

Class Organization

Class organization is chiefly determined by the boy's proficiency in mathematics. At present the Tuesday afternoon, Wednesday afternoon, and Thursday morning sections are for the most advanced. The problems to be dealt with are trigonometry and the more difficult practical application of mechanics.

The Monday section is next in advancement. For this class the students must have had some algebra and plane geometry. The work consists of a review of algebra and trigonometry as applied to shop problems.

The Thursday section is for boys who have not had the advantage of high school at all, or have attended less than a year. They receive more elementary problems, such as ratio, proportion, figuring gear trains, and elementary algebra.

The Friday classes are arranged for boys with mathematical ability equivalent to that of the seventh or eighth grade pupil. In these classes practical problems of more elementary character, such as reading micrometers, height gages, etc., are taken up; also problems in cutting screw threads, in percentage, and in ratio and proportion.

The Course of Study

A brief statement of the course of study follows:

The shop mathematics, drawing and tool design are taught by tradesmen who have taken special training and have qualified for this work according to the provisions of the Smith-Hughes Act. These teachers spend part of their time in the factories. As a consequence, the course is laid out to fit the special requirements of the trades represented in the factories from which the boys come.

Suggestions, problems, drawings, and models secured from the various shops are appreciated by the school, and are used to advantage whenever it is possible to do so. The plan of connecting the factory and the school in the drawing and shop mathematics classes reveals to the boy the value of these subjects in his daily work. As far as practicable, drawings, models, and fixtures used are direct from the factory where the boy is an apprentice. The result is greater familiarity with and greater interest in his special line of work and in the entire factory organization.

Due to the fact that the apprentice boys come with varying amounts of preparation in drawing, the instruction is almost wholly individual. Those with no experience in drawing begin by learning to letter, draw, and project simple figures. The first drawings are copied from blueprints with the model in sight. Later a free-hand sketch is made of the model. Finally, they are given a model and one or two views of the same on a blueprint and are required to supply the other necessary views and cross-sections. Practical machine and tool parts are always used as models.

The more advanced students in tool making and tool designing are given parts of machines to "tool up." They are called upon to route the operations, design

IN THE PATTERN SHOP

milling fixtures, drill jigs, punches, dies, etc., complete. They, or other students who are not so far advanced, detail all the parts. This work is conducted exactly as in an up-to-date factory, the work turned out being complete in every detail.

Large Drawings Made on Blackboards

Large drawings are made on the blackboard from which the boys make free-hand sketches. These sketches are graded and corrected and from them the student makes a mechanical drawing to scale. This is very valuable, since, at one and the same time, it teaches the necessity of observing all dimensions, cultivates free-hand work, and develops ability to interpret the sketch after it is "cold."

Working drawings and corresponding parts furnished by the various factories are drawn by the student after he actually measures the different parts. Assembly drawings and tracings are made of the more complicated machines and fixtures from which details are made. In each case the size, material, number, finish, heat-treatment, etc., are specified.

Through teaching the students how to do more accurate drawing, by means of trigonometry and methods of working mathematical problems on the drawing board, not only is their interest increased, but a broader knowledge and appreciation of both is gained.

Artificial Arms in the Shop

By Entropy

From the illustrations on page 512, *American Machinist*, one might suspect that war veterans with artificial arms might become a common sight. This, however, is not likely in this country.

We are apt to associate war with a terrible mangling of bodies and yet in this war we had only about 3000 amputation cases. Of these, less than half were arms, and among that minority only a very few were of both arms. About one man in 30 in our army had worked in or around a machine shop, so that at the outside there are probably not more than 50 cases of arm amputations who might wish to return to such work.

Again, all such men are entitled to training at the expense of the Government; and in spite of rumors and reports to the contrary, they are getting it. They are for the most part taking up work which will not require the use of artificial appliances. Some of them are taking up drafting and some are taking full courses in mechanical or electrical engineering. Some of them are branching away from mechanical things altogether into entirely new work, but the tendency is to use their heads more and their hands less.

The War Problem a Large One

This war problem so far as arm amputations among machinists is concerned, is not a large one. The large problem is that of the men who are disabled in industry itself. The victims greatly outnumber those of the war, and there is no governmental machinery for giving them the training and education to rise superior to their physical handicap. There is a great need that this should be done. The individual shop in which an accident occurs feels that it has done its share when it has paid the insurance premiums which enable the injured man to make as complete a physical recovery as is possible. It then usually expects the man to come back to work and to get along as best he can without any further training.

The result of this reasoning is seen on the street corners where such men sell pencils, shoe lacings, newspapers and other things in such a way as to capitalize their misfortunes. Some shop managers, with an eye only to labor turnover, say that they prefer men with such disabilities because the latter are more afraid to go looking for new jobs. This is however but another way of saying that they propose to take advantage of the workman's necessities, and that is hardly ethical, to say nothing of being a mighty bad policy to have known.

Training, for a disabled man, is usually a profitable thing, but he is seldom in a position to pay for it. A man whose left hand is gone, and who had been a machinist in a railroad repair shop, is badly handicapped; yet he might make a good man on small work or learn to be a draftsman and designer of the kind of machinery that he formerly ran. My personal acquaintance with drafting rooms makes me rather feel that a few men with some years of experience in the shop might be able to produce more workable designs than is now the case.

Disabled Men Sinking Into Dead-End Jobs

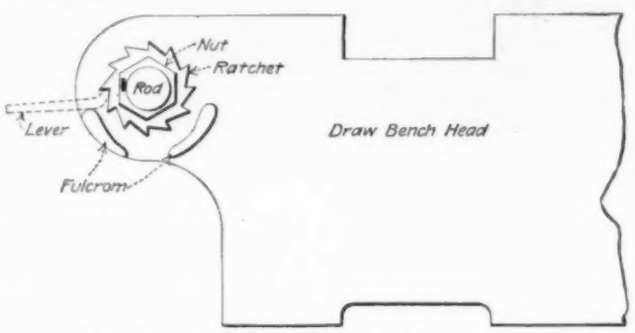
We have too many partly disabled men sinking into dead-end jobs. To put an injured man on an elevator, cleaning up washrooms, or at a toolroom window, is to admit that we are not bright enough to make use of what he has already learned. We pay for brain work in the office and drafting room and forget that these departments have no monopoly on brains.

There are in machine shops throughout the country, many men—every shop has them—that are not in higher positions simply because they left school before they should, and who cannot go back to school because they cannot get money enough ahead to do it. At least let us send to school those of them that are injured in productive work, and let them pay the tuition in better use of their heads.

A Substitute for a Heavy Wrench

BY M. E. DUGGAN

Wrenches, some of them five and six feet long, are made for tightening and loosening the large nuts on the ends of the tie rods on hydraulic draw benches. These wrenches are heavy and very awkward to handle. In



TURNING A NUT WITH A RATCHET AND BAR

the sketch is shown a cast-steel ratchet piece that is made to fit over the nut. It can be operated either right or left hand, is light in weight and is easy to handle as compared to a large and heavy wrench.

The two fulcrum pieces are part of the draw-bench head casting. The lever is made from bar stock.

The patterns for a set of various sizes are easily and quickly made and are inexpensive.

An Interesting Spline Gage

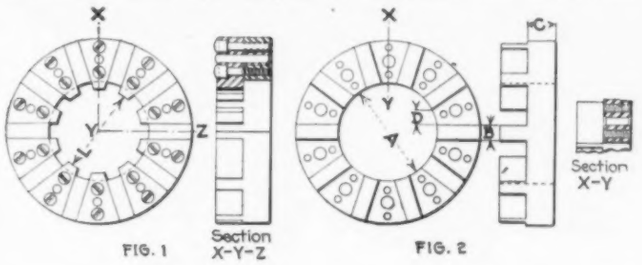
BY H. G. THAYER

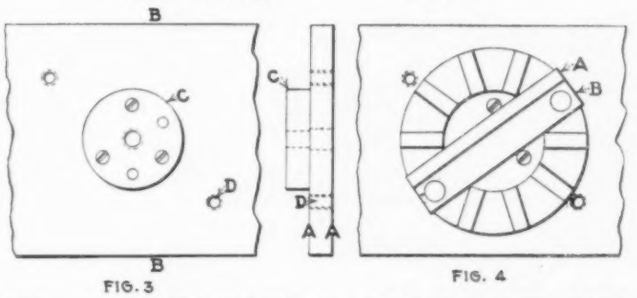
In Fig. 1 is shown a 10-tooth spline gage with inserted teeth, which is hardened and ground all over. This gage was required to be exceptionally accurate, especially with respect to the spacing of the teeth and their alignment with the center, as well as the width of space between teeth.

The main problem was to get accurate spacing, since no commercial indexing head or circular attachment would even approximate the accuracy insisted upon. After considerable thought, the following method was planned, which not only produced the gage satisfactorily, but also entailed but a small outlay for special facilities.

The body of the gage was turned, milled and hardened, leaving about 0.015 in. for grinding at *A* and *B*, Fig. 2. It was then ground parallel on the faces and the hole ground and lapped to size and at exact right angles with the face.

While this was going forward a fixture was made as shown in Fig. 3, which was merely a plate with faces *AA* ground parallel, as were also the edges *BB*. Upon this plate was fastened a round block *C*, hardened and ground all over, with the hole lapped to exactly the same dimension as *B* in Fig. 2. The outside diameter of *C* was lapped to a wringing fit for the hole in the gage body. The thickness of this block was slightly less than dimension *C*, Fig. 2. It was secured to the plate with fillister-head screws and dowels and brought to dead center between edges *B*, Fig. 3, by grinding one edge after assembly. Clamping holes at *D* were drilled and tapped in the plate and capscrews





FIGS. 1 TO 4. DETAILS OF AN ACCURATE SPLINE GAGE
Fig. 1—The completed gage. Fig. 2—The body of the gage. Fig. 3—Plate upon which the gage was ground. Fig. 4—Method of indexing for grinding the slot.

and light straps fitted to hold the gage from raising or turning on the fixture.

The gage body was placed on the fixture and the latter secured lightly against an angle plate on a surface plate, with one edge *B*, Fig. 3, against the surface plate. The first surfaces to be ground, *BB*, Fig. 2, could now readily be brought parallel with an edge *B*, Fig. 3, and the piece secured with straps. The fixture was then placed on the magnetic chuck on the surface grinding machine with one edge against the lining bar on the chuck. A Norton narrow T-shaped wheel was used, 80 grain, J grade.

Right here we discovered that although the machine we were using is supposed to be the last word in surface grinding machinery, and it was nearly new, the spindle was not at right angles with the ways longitudinally, nor parallel with them transversely. This defect had to be corrected in order to do a side swipe job of this nature,

or we would have produced concave surfaces, out of square with the face of the gage.

A plug was made to fit the hole in the block *C* on the fixture and by the use of a straight-edge across the ground surfaces, using feelers between the plug and the straight-edge, the exact amount of stock still to be removed could always be determined without removing the fixture from the magnetic chuck. Block *C* being in the center between the edges of the fixture also was an aid, since by marking the crossfeed screw, we did not need to feel our way as carefully in grinding the second side. About 0.0002 in. was left on each side for lapping.

Fig. 4 is almost self-explanatory in regard to method of indexing. *A* is a specially made parallel, whose thickness is about $\frac{1}{32}$ in. less than dimension *D*, Fig. 2. The width is about $\frac{1}{8}$ in. greater than the height of the spacing tongues on the gage body. *B*, Fig. 4, is a sine bar. The parallel was clamped to the finished ground pair of spacing tongues, and the sine bar clamped to parallel. The clamps are not shown. Of course this setting was made with the fixture clamped against an angle plate on a surface plate. For the grinding of the next pair of tongues, the parallel and sine bar were always attached to the pair previously ground.

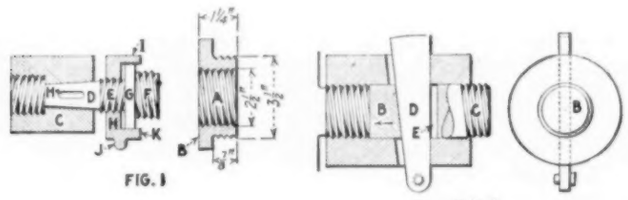
The inserted tooth-blocks presented no problems, being merely another sine bar and angle-plate job of grinding. Plenty of stock was left on the inside arcs to insure their cleaning up on the inside diameter, which was ground after the final assembly. The outside diameter was also ground after assembly for appearance sake only.

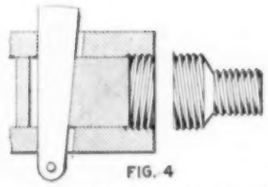
In section *X-Y*, Fig. 2, is shown a soft plug in the gage body, into which the dowel hole from the teeth were transferred after the latter were located. These soft plugs were not called for on the drawing, but were necessary.

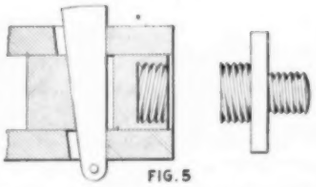
Chucks for Holding Threaded Work

By E. A. Dixie

The illustrations, Figs. 1 and 2, show a threaded mandrel or chuck for holding brass flanges for the second operation which consists of turning and threading the exterior. The work is shown at *A*, Fig. 1. It is a brass flange which is threaded internally in a previous operation, while at the same time the face *B* is made flat and square with the threaded hole.







FIGS. 1, 3, 4 AND 5. CHUCKS FOR HOLDING THREADED STUDS

Figs. 1 and 3—Holding work by an internal thread. Figs. 4 and 5—Two ways of holding by external threads.

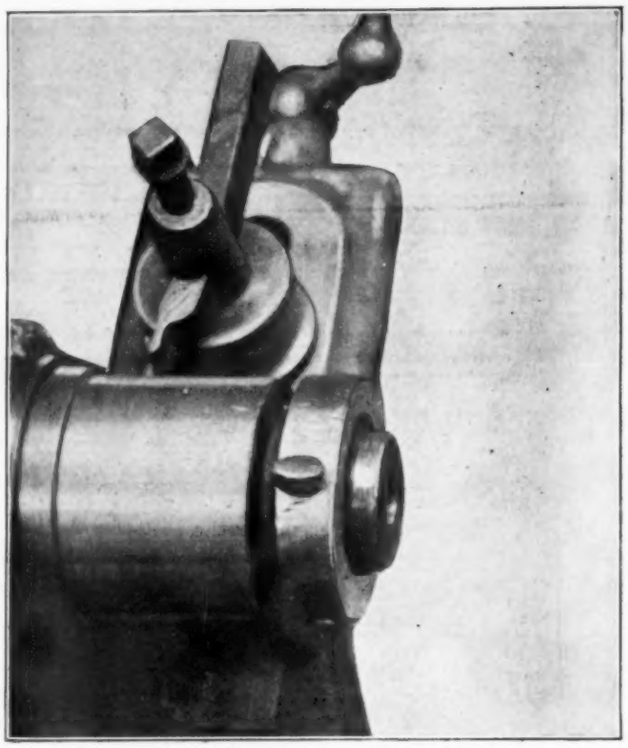


FIG. 2. CHUCK ON SPINDLE NOSE

The chuck *C* is made of machine steel and threaded to fit the nose of the Fox lathe as shown in Fig. 2. Fitted to it is the tool-steel plug *D*, Fig. 1, which is a taper fit in the member *C*. A tapered key passes through *C* and *D* forcing the latter to its seat in *C*. The plug *D* is threaded at *E* with a left-hand thread and at *F* with a right-hand thread to match the thread in the work. A flange *G* is formed on *D* between the right- and the left-hand threads. A tool-steel nut *H* is fitted to the left-hand threaded portion *E*. It has a flange *I* extending axially and a lug *J* on the outside. This is also visible in Fig. 2. Its object will be shown later.

In operation, the nut *I* is run forward till the face *K* is beyond the face of the flange *G*. The work is then screwed on till its face *B* encounters the face *K* of the nut *I*. Further turning of the work in the direction to screw it on the member *F* also tends to turn the left-hand nut *I* so that it jams the work. The threading operation, therefore, has a tendency to tighten the work on the mandrel. When the operation is finished the operator gives the lug *J* a blow with the hammer which drives both the nut *I* and the work *A* in the directions which tend to loosen them, one from the other.

Using this mandrel one man can thread from 50 to 60 pieces per hour on the Fox lathe. This includes the time of starting and stopping the lathe for each piece.

Another chuck used for the same purpose is shown in Fig. 3. The principal member is fitted to the lathe spindle nose and the plug *B* is a snug sliding fit in it. One end of *B* is threaded at *C* for the work. A slot passes through *B* for the tapered key. The slot in *B* has clearance *E* so that the key when driven causes *B* to move in the direction of the arrow. The outer end of the slot in the member is square with the axis of the lathe. Clearance is provided at the other end. The head of the key is made wider than the slot so that it cannot fall through from that direction. The small end has a hole driven in it into which a cross-pin is driven

to prevent it from falling out in the other direction. In operation the lathe spindle is turned so that the small end of the key is on top. When in this position with nothing on the threaded end of the plug the key will drop. The work is now screwed on the thread *C* till it barely touches the face of the chuck. The lathe spindle is now turned till the large part or head on the key is on top, and the operator gives it a blow with his hammer and draws the work tight up against the chuck face. After the work is finished a similar blow on the small end releases the work.

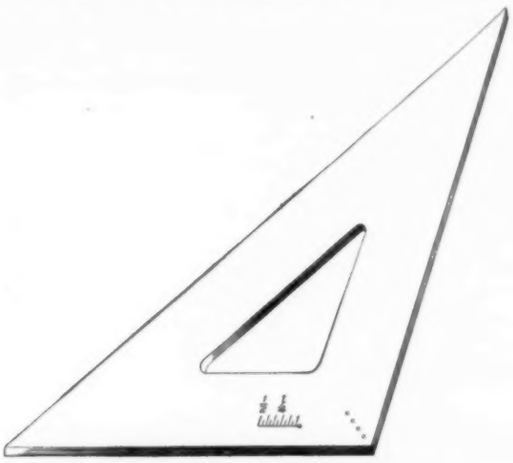
In Fig. 4 is shown the arrangement for holding work which has an external thread but no flange. Fig. 5 shows the construction of a chuck for holding externally threaded work with a radial flange.

Handy Addition to Draftsmen'sTriangle

By Raoul J. Hoffman

The sketch shows a kink which will save some few minutes for the draftsman at odd times, as it will enable him to make accurate measurements without a scale.

The four holes at the right angle are for the purpose of determining the points of intersection when



KINK IN DRAFTSMEN'S TRIANGLE

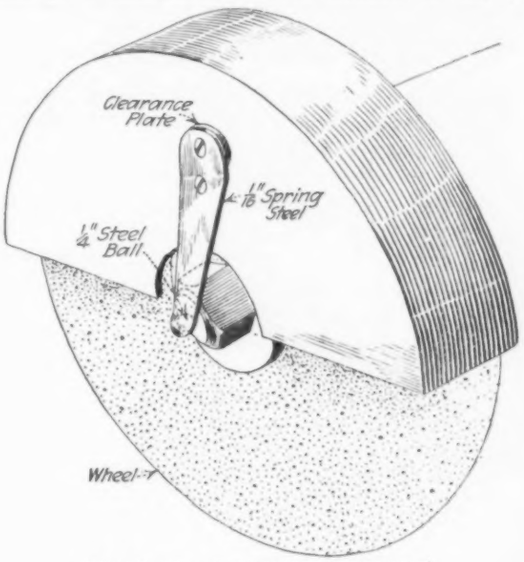
laying on border lines. They are respectively $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, and $\frac{3}{8}$ in. from the angle.

The single hole, with the graduated scale running out from it parallel to the base of the triangle, enables one to lay off a point at any predetermined distance from an existing line by simply bringing the required graduation mark over the line and dotting through the hole which represents the zero line of the scale.

A Surface Grinding Machine

By E. J. McWhirter

Difficulty is often experienced in grinding with the side of a wheel on a surface grinding machine because of its grinding heavier when it enters upon and leaves the work being ground, thus grinding the piece anything but flat. Pointing a stick and holding it against the center will overcome this trouble but that soon becomes tiresome and it is seldom the stick is there when you want it, so I put on a spring end thrust as shown in the sketch. To do this secure a piece of flat spring steel, annealed, about $\frac{1}{16}$ in. thick, and near one end press into it a steel ball which should be of the proper size to fit nicely into the spindle center. Cut the spring to the desired shape and drill the screw holes. Place the ball in the spindle center and the spring against it at the seat, and lay out the holes to be drilled and tapped into the guard; it can then be seen if a clearance plate is needed or the spring



KINK ON GRINDING MACHINE

bent. The spring is then tempered and the holes in the guard drilled and tapped. The spring can be easily attached or removed. This is very successful as a time saver and produces a neat job.

Safety Device for Punching Machines

By Joseph Hewes

The accompanying illustration shows a pneumatic control for a punching machine in which it is necessary for the operator to open two valves, one with each hand, in order to engage the clutch. As these valves are located on opposite sides of the machine it is impossible for the operator's hands or fingers to be in a position of danger while the ram is descending.

Failure of the air pressure from any cause will render the clutch tripping-mechanism absolutely inoperative.

These devices are attached to all punching machines in the Dayton Engineering Laboratories Co.

SAFETY DEVICE FOR PUNCHING MACHINES

EDITORIALS

Making the Most of Christmas

THIS is the Christmas season when the spirit of friendliness and good will has a particular appeal to all. What better time can there be for all of us to try and free ourselves from the prejudices, resentment and antagonism which may have been built up during the past year?

The reaction from the strain of war has affected us all. The great incentive for coöperation no longer exists and there has been a slowing down in production and in too many cases a growing suspicion of the other fellow, no matter who or what he is.

Real prosperity cannot survive under such conditions. We must all pull together for the sake of the country as well as for ourselves.

Now is the time for everyone to ask himself what he can do to further the establishment of cordial relations, to secure the confidence of all those with whom he is associated.

The employer should study his shop and relations with his men in a critical manner and with an open mind. Has there been any reason, or the semblance of a reason, for lack of confidence? If so, how can it be eliminated?

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The man in the shop must also ask himself similar questions. Has he given his full share of thought and energy to his work—has he given reason for the suspicion that labor was not doing its share?

Neither side is wholly right or wholly wrong—there have been faults on both sides and we should not waste time in expecting perfection from either. The millennium is not likely to appear in 1920 or even the year after.

But we can all do a little to help make this old world a better place to live in if we try to do our share toward securing an understanding between men and if we do what we can for the elimination of reasons for suspicion and antagonism.

This is a time for plain thinking and plain speaking. We cannot expect the blind loyalty of ancient days, nor do we want it. We must give reasons for our actions as never before. But having done this, we have a right to expect and to demand coöperation from our coworkers, and if we fail to get it, we must search carefully to find where the trouble lies—whether in the method of management or in the spirit of the shop.

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Coöperation—the only way to secure the production which we so sadly need—is a vital necessity in all industry today. And coöperation means securing the good will and the interest of all concerned. Real cooperation cannot be secured by strong-arm methods.

What better time then, than this, the Christmas season, to make a real beginning toward this very desirable and very necessary end? What better use can we make of this season of "peace on earth and good will to men" than to do our best to apply these precepts in our daily work? Why not take advantage of the time of year when all are mellowed by the traditions of the past to secure as best we may, the good will of all those around us as a basis for better methods in securing real coöperation in the future? Let us resolve to put our hearts in our work and give full value for every dollar received, or for every hour of labor used.

The Smith-Hughes Act

HOW many employers are familiar with the provisions of the Smith-Hughes Act?

The Smith-Hughes Act as passed by the Sixty-fourth Congress provides for the promotion of vocational education; for coöperation with the several states in the promotion of such education in agriculture and in the trades and industries; for coöperation with the states in the preparation of teachers of vocational subjects. It appropriates money for the above purposes, increasing from five hundred thousand dollars for nineteen hundred and eighteen to three million dollars for nineteen hundred and twenty-six and each succeeding year. These amounts are to be allotted to the states in the proportion which their urban population bears to the total urban population of the United States, according to the last preceding United States Census.

In order to secure the benefits to be derived from the above appropriations, it is only necessary for a state, through its legislative authority, to accept the provisions of this Act and to designate or create a state board, of not less than three members, empowered to coöperate with the Federal Board for vocational education as provided.

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Briefly, the Smith-Hughes Act provides for the vocational training of the youth of our land. This may be accomplished in workshops and schools owned or controlled by a state or one of its cities, or in privately owned shops in conjunction with state or city schools. Youths may receive such vocational training as will fit them for industrial work and those already at work may have the benefit of a certain number of hours per week at schooling in the branches that relate to the industries in which they are employed.

The old apprentice system is a thing of the past and to a certain extent this is well, as under it much valuable time was lost in doing unnecessary things.

With schools operated under the provisions of the Smith-Hughes Act, a boy or girl may, with the consent of his or her employer, go to school for a certain number of hours (during working hours) each week.

No boy in a machine shop who has any red blood in his veins can afford not to take advantage of such an opportunity. No employer who wants to bring his young employees to a higher standard of efficiency can afford not to accept the advantages of the Smith-Hughes Act.

In another part of this issue is told how some employers in the Middle West are coöperating with the board of education in their state in regard to this Act and are receiving benefits therefrom.

John H. Van Deventer Enters a New Field

MAJOR JOHN H. VAN DEVENTER, Editor-in-Chief of the *American Machinist*, has resigned in order to head an organization which has for its purpose the initiation of a national anti-radical movement. His program entails coöperative efforts on the part of the industrial leaders of the country whereby all recognized forms of publicity are brought to bear to instill the comprehension of basic economic laws underlying sane industrial thinking. The headquarters of the campaign will be in the offices of Cleland, Incorporated, 48 East 41st Street, New York City. Major Van Deventer is the president of the organization and Harry E. Cleland, formerly advertising counselor of the McGraw-Hill Co., Inc., is vice president.

Major John H. Van Deventer

Major Van Deventer was born in Paramus, N. J., April 24, 1881. He graduated from Cornell University as a mechanical engineer in 1903, after which he served an apprenticeship in the shops of the Niles Tool Works of Hamilton, Ohio. In 1905, he was employed by the Goulds Manufacturing Company as a cost clerk and one year later was made superintendent of production in charge of all their plants.

In 1907, he became factory manager of the Buffalo Forge Company, serving in this capacity until 1914, when he joined the *American Machinist* as associate editor. In 1915, he was made managing editor and editor-in-chief in 1916.

His term of service with the *American Machinist* has helped to demonstrate the possibilities for public service existing in the technical press. Under his guidance in 1915, the *American Machinist* began an intensive campaign to educate American industries in the technique of munition manufacture. This was two years before the United States entered the war and so thoroughly was this work done that the Chief of Ordnance gave special commendation to the *American Machinist* for these services.

In September, 1917, the Government requested his services in helping to organize the Ordnance Department and he was given the rank of major. He formulated, installed and managed the system of control for the Drafting and Design Section of the Gun Division, coördinated the work of design, procurement and inspection, and organized a military information branch. Perhaps the most valuable service which he rendered the Government came through his connection with the machinery building industry; through it he was instrumental in securing for the Ordnance Department the services, as commissioned officers, of many men qualified to handle the numerous difficult specialized problems arising daily.

On his return from service, Major Van Deventer's first editorial act was to correct the erroneous but somewhat general impression regarding the merit of services of officers who were unsuccessful in getting overseas. His efforts in this connection were aided by many newspapers throughout the United States with the result that the value of the technical services of American industrial experts in this war has been thoroughly impressed upon the public.

Major Van Deventer, as the temporary secretary of the Army Ordnance Association, has been largely instrumental in organizing the association of American manufacturing executives and reserve and active Ordnance officers into a body for the purpose of insuring adequate industrial preparedness. Under his editorial guidance the *American Machinist* has been instrumental in promoting the passage of the Caldwell Bill which makes one million dollars worth of Government owned machine tools available to trade and engineering schools at 15 per cent. of their cost.

In addition to his experience as an industrial executive and editor, Major Van Deventer is also a successful inventor and has been a frequent contributor of industrial articles to the general periodicals, and an author of several scientific and industrial books.

With Major Van Deventer's resignation, a new line-up of the staff of the *American Machinist* has been made necessary. Ethan Viall and Fred H. Colvin have been made Editors, and Kenneth H. Condit, Managing Editor. Mr. Viall will have entire charge of the organization, all of the associate editors and editorial office force reporting to him through Mr. Condit. Mr. Colvin will be Chief Field Editor.

Has the Producer an Equity in Production?

By ENTROPY

The unrest of labor is becoming more and more of a world problem, and the question as to what will keep it satisfied is a momentous one. Raising the workman's pay seems only to have whetted his appetite for more and yet more money. Various schemes have been proposed to placate him; among others, the proposition to take him into partnership with limitations as to his voice in the management of the business. The author of this article tells wherein, in his judgment, this latter is not a good scheme and gives as his opinion that wide publicity of the employers' business affairs is the proper remedy.

THE majority of men have, at some time or other, the intense desire to go into business for themselves. They usually say that it is so that they can be independent, but all of them realize, or do soon after, that the independence of the man in business is not independence of other people but the independence that comes from a greater accumulation of savings. When one works for another, all he gets is in the pay envelope, but the moment he works for himself he can put something of himself back into the business at once. It may be only by building up such an organization that he can take a day off to be sick or to go to the world's series without any dimunition of his earnings. To be sure, as a subordinate working for some one else he might do the same thing but he feels himself beholden to some one higher up to whom he must explain why he wishes to be out.

The Great Question of Today

So far as other independence is concerned, he finds that he has left one boss to take on as many others as he has customers, all of whom have different ideas which he must study. There is no doubt that most men who go into business work much harder than they did for some one else, though the question may be raised as to whether they work any harder than they would if the same hopes and incentives were held out that they imagine are ahead of them when they start out for themselves. The great question today is how to put men in such a frame of mind that they will work as they would if in business and yet have them submit to the necessary leadership to make the works, as a whole, profitable.

The answer to this question may be found if the individual worker be allowed to acquire an equity in the plant in which he works. If so, there should be some way in which he can realize it and make it a part of his capital. The only way he can secure an equity in the concern is by doing more than he is paid for week by week or month by month.

The Bonus-Stock Difficulty

This has been interpreted to mean that the only way a man can get his equity is through the profit and loss account, by being given stock in the company at such times as a profit appears. The difficulty is that men who receive this bonus stock want to find out what it is worth, and most of them would sell it immediately, add the sale price to their earnings for the year and take no part in the management of the company. The few who do save, or who can save under the present high cost of living, save anyway, so that this stock distribution really does little good in the way of increasing thrift, or added interest in the company. Stock issued with a string to it is not distributed at all, and is so understood by most workmen.

A great many attempts have been made to give the worker his equity, or rather to encourage him to make an equity which could be given to him, but most of them have rather dwindled away and there are more that are historical than there are that are active.

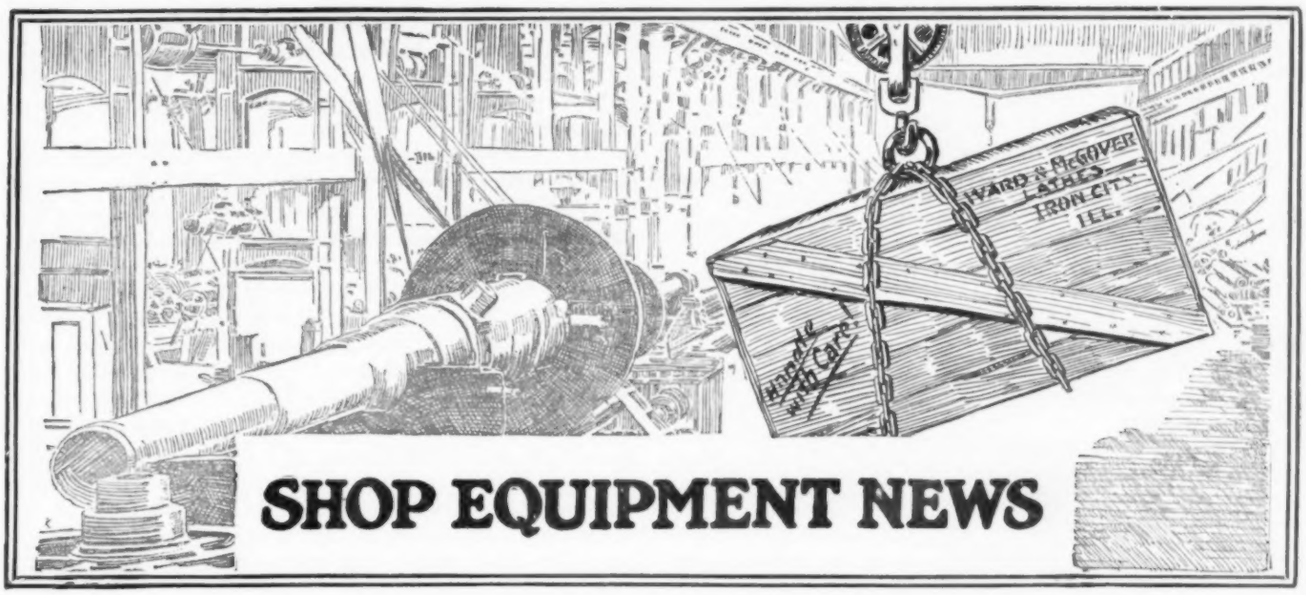
No Effort Being Made to Overcome Ignorance

The things which prevent men from taking an interest in their work and building up an equity which can be given them in a tangible form are mostly based on ignorance, and ignorance that few of us are making any effort to overcome. It is ignorance on their part as to how the money which is received from the sale of goods is spent. It is ignorance of how expensive it is to sell goods, of what overhead expenses mean, and, on the part of the employers, it is ignorance of how to make their employees understand these same things. There has been a lack of confidence on the part of employees because their employers do not lay the cards on the table and tell them just how the works have to be run, and this is caused by the knowledge, born of experience, that the workmen would not understand these things if they were explained to them by the best accountant or business manager. There seems to be a lack of men who can explain business affairs to others who do not possess the education that they themselves have.

The trouble is further complicated by the rapidity with which men are in the habit of moving from one shop to another. We can only hope that if men are brought more closely into touch with their employers, and know more of their affairs, that they will less often feel that they are unjustly treated and will stay longer in one place. It is nothing more than natural for men in one shop to hear rumors of what some one man in another shop received in his pay envelope for a certain week and to assume that everyone in that shop was paid the same every week. The result is extreme soreness, especially if the news is picked up by the man's wife as is usually done.

Publicity and Plenty of It the Only Cure

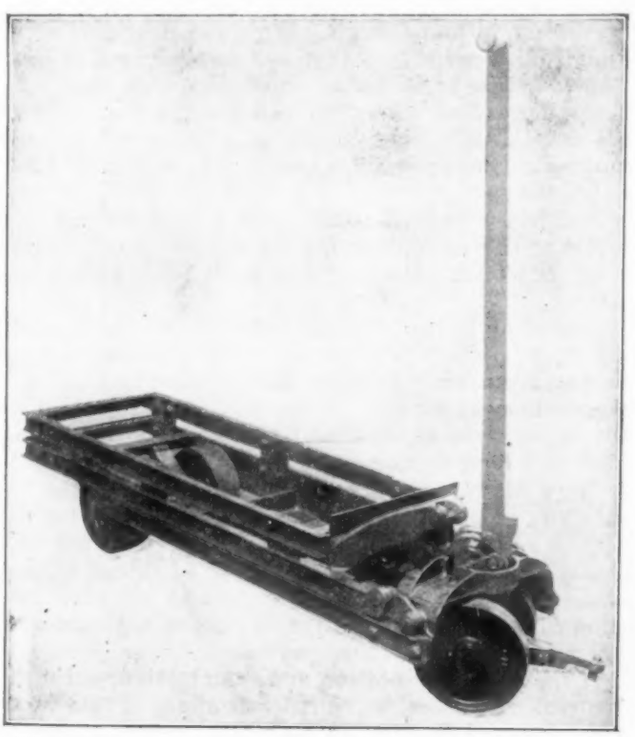
The only cure seems to be publicity and plenty of it. The old idea that a firm's business was its own business and no one else's is all exploded except in the minds of a few. It is very much the business of everyone else. It is the business of its banks, its creditors, its customers, the general public and its employees, as much as it is its own. The two times when publicity is obnoxious to a firm are when it is making too little money and when it is making too much. In the first instance, even though it may not believe it, publicity will enable it to secure funds and raise prices; in the last, it ought to force prices down or quality up, and that is where the shoe pinches.



SHOP EQUIPMENT NEWS

Barrett Combination Lift and Trailer Truck

A feature in truck construction just introduced by the Barrett-Cravens Co., 169-73 Ann St., Chicago, Ill., is a lift-truck for use as a trailer behind a power unit. The ordinary power truck used in many plants will pull from five to ten of the combination trucks and at any time a trailer is disconnected from the power truck it may be drawn away as a lift-truck, operated by man power. These trailer trucks are built in all models in which lift-trucks are supplied, and have capacities of 2000, 3000 and 5000 lb. with carrying frames ranging in size from 17½ to 27 in. in width and from 30 to 72 in. in length. When in use as a trailer, the handle of each truck is automatically locked in an upright position. Arrived at its destination the trucker has only to release the handle and draw it away as an ordinary lift-truck. The coupling links are of rolled steel, the rear link connecting directly to the rear axle making for the utmost rigidity. The front link will turn through an angle of 180 deg. and in no way interferes with the full turning radius of the front wheel. It is claimed that on account of the rigidity of the coupling links there is no possibility of collision between the trailer trucks and there is no chance of piling-up when the power truck stops suddenly. For the same reason the train may be started smoothly and without a succession of jerks. The manufacturer is prepared to furnish to users of this make of truck the necessary extra parts to convert them into trailers.

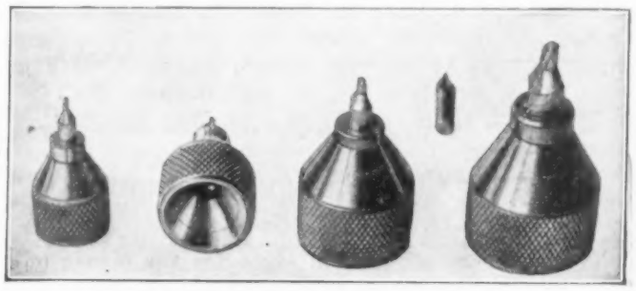


BARRETT COMBINATION LIFT AND TRAILER TRUCK

Lindquist Combined Center Drill and Countersink Holder

The Lindquist Engineering Works, Portland, Conn., has recently placed on the market a tool for drilling centers in the lathe, designed to do away with the necessity for taking out the tail center and putting in a chuck. Though this tool has the appearance of a small chuck, it is in reality a single piece of steel, hardened, and the recess accurately ground to 60 deg. to fit over a tail center. The small taper hole for receiving the combination drill and center reamer is ground at the same setting, insuring perfect alignment of the drill when placed on a lathe center.

The knurled portion enables the operator to hold the tool easily with thumb and finger while centering,



LINDQUIST DRILL AND COUNTERSINK HOLDER

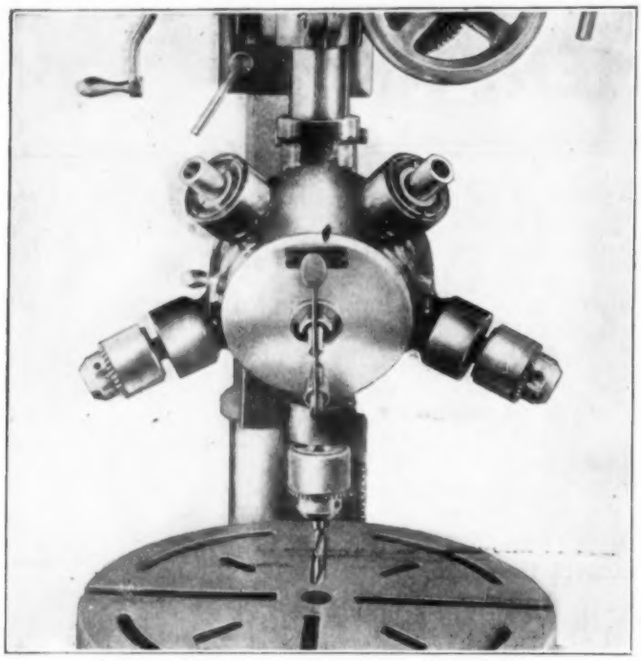
and the whole operation may be accomplished in less time than would be required to remove a tail center and put in a chuck.

The shank of the centering drill is tapered to fit the small hole on the end of the tool, and when worn out or broken may easily be replaced.

The tool is made in four sizes for numbers 13, 30, 46 and 52 drills respectively.

The Fortin Five-Spindle Drill Head

The Stafford Tool Works, Hartford, Conn., has placed on the market a five-spindle turret head as shown in the illustration. This attachment is intended for use on drilling machines and is made in two styles and



FORTIN FIVE-SPINDLE DRILL HEAD

five sizes. The spindles may be fitted either with drill chucks or sockets.

The gears, taper shank, index pin and bushing are made of steel, hardened and ground, and all rotating parts are fully equipped with ball bearings. The spindles run at the same speed as the drilling-machine spindle except in the No. 0, the speed of which is increased. Only the spindle in use revolves, being thrown in gear as it is brought to the operating station.

Style No. 1 (illustrated herewith) is clamped to the drilling-machine sleeve. Style No. 2 is provided with a taper shank to fit the spindle of the drilling machine.

The different sizes will take drills of the following diameters: No. 0, 0 to $\frac{3}{8}$ in.; No. 1, 0 to $\frac{3}{8}$ in. with chuck, or $\frac{31}{64}$ to $\frac{9}{16}$ in. with socket; No. 2, 0 to $\frac{17}{32}$ in. with chuck, or $\frac{37}{64}$ to $\frac{29}{32}$ in. with socket; No. 3, $\frac{1}{16}$ to $\frac{3}{4}$ in. with chuck, or $\frac{53}{64}$ to $1\frac{1}{4}$ in. with socket; No. 4, $\frac{3}{8}$ to 1 in. with chuck, or $1\frac{17}{64}$ to 2 in. with socket.

Sorting Out Garage Mechanics

BY JOHN R. GODFREY

There's a ray of hope in sight for the owner of a buzz wagon who hasn't time or doesn't know how to fix the buzzer when it doesn't buzz. At present he is at the mercy of any garage mechanic who may open a shop and pretend to know all about cars, but who is oftentimes a better butcher or barber than he is an auto expert. But cheer up—there's better things acoming.

Out in Oregon they have a law that anyone who tinkers with an automobile for more or less coin of the realm, must have a license from a board of automotive examiners, for which they charge him five simoleons—which you pay, of course, in the long run. And if the car only runs long enough you don't mind. But this hope for the autoists only affects those who have a real overhauling job done—or who can afford similar luxuries—to any great extent. Because the garage mechanics are all so religiously inclined that they refuse to work at all on Sunday. Then to satisfy the seventh-day adventists, they knock off at noon, Saturday. So when any poor benighted mechanic or ribbon-counter clerk takes Lizzie out for exercise on Saturday or Sunday, he's out of luck if anything happens to her interior decorations. If a commutator wire breaks, or comes loose, or a spark plug fouls, he just naturally camps out on the road till Monday morning. It isn't a question of time and a half or even double time—they just quit the job cold and every man Jack of them takes out his own Lizzie or goes fishing.

HOW WOULD YOU CLASS?

The wage demands are not so bad—not averaging much higher than garage mechanics are getting at present. But they sort the men out in classes which are a bit unusual and interesting. Perhaps some of us may find out where we belong. They rate machinists at a dollar an hour, journeyman mechanics at 87½ cents, mechanics 75 cents and helpers 50 cents. Which is which and where do we fit in?

My own experience with garages and repairs is largely vicarious—I've heard the other fellow tell his troubles. But there seems to be room for improvement in many cases. Why will men persist in promising work before they can possibly get it out? And it seems to be an accepted situation that it is never quite done when you call for the bus, even if it's a week after it was promised. Someone is always putting on the finishing touches—which usually don't finish it.

And here's another point which I've doped out into a sort of rule of conduct for the enjoyment of a motor trip. Don't have your car overhauled just before you start.

According to my own observations and the tales of my friends who are fortunate enough to own a buzz wagon, it's always fatal to an enjoyable trip. Something always happens. Some bearing is too tight or too loose, or some wire isn't tightened, or something else isn't done or is overdone. The only safe rule is to have the repair work done about three months before you go on the trip. This gives you time for the several return trips to the shop which are always necessary—or to do your own adjusting of things in general—or to give the whole car time to get back into good running condition after its session with the garage mechanics.

If the new classification and examination will make 'em real mechanics, we can almost afford to stay home Saturday and Sunday or else do our own tinkering on the road.

This is our delayed issue of December 25, 1919. This news is, however, up to date.

Sparks from Industry's Forge

Edited by E. C. Porter

British Invention of a New Artificial Light

A light that far surpasses any existing arrangement of artificial rays and that is the closest approximation to actual daylight ever effected, is understood by the American Chamber of Commerce in London to have been perfected there.

The apparatus consists of a high-power electric-light bulb, fitted with a cup-shaped opaque reflector, the silvered inner side of which reflects the light against a parasol-shaped screen placed above the light. The screen is lined with small patches of different colors, arranged according to a formula worked out empirically by Mr. Sheringham, the inventor, and carefully tested and perfected in the Imperial College of Science and Technology.

The light thrown down from the screen is said to show colors almost as well as in full daylight. Under the new light, delicate yellows were quite distinct, indigo blues were blue, cobalts had their full value, and violets lost the reddish shade which they display under the ordinary electric light.

The American Chamber says a great future is expected for this invention in such uses as the lighting of show windows and art galleries, studio work of all kinds, dyeworks, tea and tobacco blending and many other industries. Color photography will also probably benefit from it.

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Machinery and Tool Trade of Sumatra East Coast

Previous to 1917 the United States exported to the Sumatra East Coast very small amounts of machinery and tools. The Netherlands practically controlled this market, with Great Britain and Germany participating. During the latter years of the war the Netherlands was unable to supply its colonies, and the importers bought in the United States as the most available source of these commodities. Although it is not expected that America will continue to supply such large quantities, yet its share will still be very large, providing that the difficulties of delivery are improved and the credit terms easier and more in conformity with those of competing European countries.

The United States' proportion in imports of agricultural machinery rapidly increased from less than 1 per cent. in 1915 to 8 per cent. in 1917, with a decrease to 4.8 per cent. in 1918. The total imported values, expressed in gold dollars, were: For 1915, $247,004; 1916, $173,802; 1917, $336,697; and 1918, $323,422. For the first six months of 1919 the value of the imports was $121,975.

In respect to steam machinery for workshops, the United States stands in a most favorable position. It supplied 22 per cent. of the imports in this line in 1918, being only exceeded by Singapore, which is merely the distributing point for European and American products.

Educational Institutions Take Notice

AN ACT, known as the Caldwell Bill, recently passed by Congress, provides for the sale, to TECHNICAL AND EDUCATIONAL INSTITUTIONS, of machine tools at 15 per cent. of their cost to the Government.

Plans are not yet fully completed determining the procedure by which educational institutions may procure tools but it has, however, been determined that an accredited list of schools will be developed in the Office of Director of Sales.

Schools that wish to take advantage of this Bill should make application to be placed on accredited list, to the Director of Sales, P. S. & T., Munitions Building, Washington, D. C.

The *American Machinist*, which fathered the Caldwell Bill, expects to have full details of the proper procedure very shortly. They will be given a prominent place in an early issue.

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Sales Made by the War Department

Total sales made by the War Department for the week ended Dec. 12, 1919, amounted to $3,994,842, according to reports submitted to the Director of Sales by the various bureaus having surplus material for sale. The largest figure in the weekly total was $1,283,572 which is the receipts for the week from the Army Quartermaster retail stores.

From Jan. 1, 1919, to Dec. 12, 1919, total sales by the War Department amounted to $528,520,830, which represents a recovery by the Government of approximately 73 per cent. of the original cost of the materials sold.

Trade Currents from Cleveland and Chicago

CLEVELAND LETTER

The wind-up of the year's business in the machinery industry finds the Cleveland trade better satisfied with the end of December's activities than was expressed two month's back. While there has been a significant falling off in business due to the steel, coal and similar labor disturbances, and also to the inventory taking as usual at this season, there has not been the marked depression generally seen at the holiday period, leading members of the trade assert. Final inquiries and orders for the year have been of a miscellaneous character, but mostly directly or indirectly related to the automobile business. On the whole, it is claimed that there is fair business closing at this time, with the volume for December better than for January last. It is the belief of the trade in general that the slackening off in the last few weeks is but a lull before the recovery and that the first three months of 1920 will be as good, if not better, than the last three months of 1919. This prediction is based upon the general interest of manufacturers and the large amount of missionary work done during the last month or so by representatives of machinery producers.

One problem that is becoming less a problem almost daily is that of labor, as it relates to the steel and coal industries. While it is admitted that the strike in the steel trade is not over in the true sense of the word, nevertheless production is on the increase steadily. A victory for increased production is contained in the restraining order of the United States District Court, as handed down by Judge D. C. Westenhaver, preventing permanently the mayor and chief of police from interfering with the importation of workers at plants in the Cleveland steel district of the American Steel and Wire Co. The move is the final outcome of a petition for an injunction, filed Nov. 29, and which was the result of alleged discrimination on the part of city officials in searching new workers for weapons and alleged unwarranted arrests since the steel strike began last September. The restrainer is qualified with a statement that does not prevent arrests of persons if there is certain knowledge imparted to police that such persons are believed guilty of a felony.

Relief from coal shortage and consequent need for shutting down industry,

is likewise noted. According to report of the Cleveland coal committee coal receipts are on the increase. This will be parceled out to different plants, which will make it unnecessary for them to stop operations for lack of fuel. This plan will be followed until coal receipts are normal again. Miners throughout Ohio have returned to work. More new projects for the new year, that are expected to mean additional demands upon machinery interests, are announced for the week. Among the most promising is the new building program of the Ohio Body and Blower Co., to be built at Detroit Ave. and West 92nd St., Cleveland, at a cost of $450,000. The new plant will be used largely for the production of automobile bodies. The Glenn L. Martin Co., which manufactured airplanes during the war, is planning to enter the wireless-telephone business. This announcement is made following the completion of tests by the company's radio inventor, F. S. McCullough. Tests have been made between the Martin plant here and Elyria. At first production will be confined to transmitters only. Eventually, it is expected the wireless telephone will be made a practicable instrument for commercial use, says Mr. McCullough.

W. J. Beck, director of research, American Rolling Mills Co., Middletown, Ohio, addressed the Cleveland Engineering Society on the manufacture and testing of electric sheet, at its monthly meeting here last week.

CHICAGO LETTER

The end of the coal strike and the immediate removal of restrictions on industrial operations came just in time to avert a serious condition in the machinery business in the Central West. Coal shortage was so acute that many plants in the important production area around Chicago and Rockford were compelled, two weeks before so ordered by the Fuel Administration, to operate on a three-day week schedule. As many plants were up to that time running overtime and double shifts to cope with the heavy flow of orders, it would have taken but a short period of such conditions to seriously affect their production schedules.

With the coal strike over and with every road rushing fuel into this district under right-of-way even over passenger trains, disastrous results are averted—how narrowly only those who daily measure the diminishing coal supply will ever know. No material difference has been made in deliveries, all classes of tools requiring about the same length of time as in the past two or three months.

With local dealers business continues excellent. With short hours enforced on machine users and a complete shutdown appearing imminent, the disposition seemed to be to purchase additional tools in order to speed the work in hand. Retrenchment does not seem to enter into their consideration. Instead of a "seasonal slump" business is better this week than at any time in the past 30 days.

Orders continue to cover the widest range and to consist chiefly of one- or two-piece lots. Goods on the floor, both new and second hand, are in great demand, and at present stocks seem more depleted than at any time during the year. Sheet-metal-handling apparatus seems still to be most greatly in demand, punching machines and drills being almost unobtainable. The wide range of territory being supplied by Chicago houses is a feature, orders being displayed this week from Albany, N. Y., Pocatella, Idaho, and Galveston, Texas.

There is no other road to social justice but to obey the positive injunction — As you would that others do unto you, do you even so unto them; and compliance with this sweet and simple privilege will bring to all — Peace and Plenty, Good Cheer and Good Will.

Christian Girl
PRESIDENT
The Standard Parts Company

The Guyton and Cumfer Manufacturing Co., maker of special machinery, announces letting a contract for a two-story machine shop to contain 25,000 sq.ft., and the Buda Co. is building a new foundry. Several other small factories were placed under way last week but, on the whole, building announcements have fallen off materially, due probably to severe weather and rising costs, in equal proportion.

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High Mark Reached in Pay for New York Factory Workers

New York State factory workers' earnings passed the $25 mark in November, and reached an amount 100 per cent. higher than the average for June, 1914. The November weekly average was $25.37, which is 96 cents or 4 per cent. above the October average earning, and 54 cents or 2 per cent. above the previous high mark of $24.83 in September.

These facts appear in the tabulation of reports from 1648 manufacturers by the Bureau of Statistics of the State Industrial Commission.

Factory workers' earnings were $3.77 or 17 per cent. higher in November than a year previous. The gains in the various industries run as high as $11 weekly.

Nearly every brand of manufacturing reported increased earnings in November. The gains in general are greatest in industries which showed low earnings of workers in October, but substantial increases appear in other industries.

Making Changes in Airplanes for More Strength and Efficiency

American De Haviland-4 army airplanes are now being remodeled to make them safer and more efficient. The remodeled type will be known as the DH-4B. In the new model the gasoline tank will be moved forward to the present position of the pilot's seat and will have a fire-wall between it and the engine. The pilot's seat will be moved back close to and directly in front of the observer's cockpit. This seat will then no longer be between the gas tank and the engine, and the greatest source of danger in the present model will be eliminated. The arrangement of the instrument board, machine gun and some of the engine accessories is also being changed.

The War Department has been advised in reports from England that a number of aircraft companies there are desirous of obtaining Liberty motors, in a moderate quantity, for use in commercial types of airplanes. The reports state that the companies are favorably comparing the Liberty engine with such British makes as the Rolls-Royce and the Napier Lion, which cost considerably more than the Liberty.

* * *

English Firm Wants Quotations on Machined Axle Forgings

The Sentinel Wagon Works, Ltd., Shrewsbury, Shropshire, England, is asking for quotations on 400 machined axle forgings 5 ft. 3 in. long, 800 forged steel top caps and 800 forged steel bottom caps to be supplied to the air board, specification S.26, November, 1917.

The chemical analysis is as follows: Carbon, between 0.35 and 0.45; manganese, between 0.5 and 0.8; silicon, not more than 3 per cent.; sulphur and phosphor, not more than 0.04.

Heat-treatment, to be hardened and tempered to give the following physical tests: Ultimate tensile strength, not less than 40 tons or more than 50 tons per sq.in.; yield ratio, not less than 60 per cent.; elongation, not less than 22 per cent.; production of area per cent. plus elongation per cent., not to be less than 70 per cent.

The machining allowance is to be left where marked in red.

Further details may be obtained by direct correspondence with the company.

* * *

Machine-Shop Millings and Turnings for Sale

The Salvage Division, Office of the Quartermaster-General of the Army, is offering for sale under sealed proposals approximately 100,000 lb. of machine-shop millings and turnings, all clean and practically dry, located at the Springfield Armory. Bids will be received until 2 o'clock on the afternoon of Dec. 30, 1919, by the Salvage Officer, Springfield Armory, Springfield, Mass.

Exports and Imports for November Large

Exports and imports in November reached the second highest mark in the nation's history. The Department of Commerce announced the value of exports was $741,000,000, compared with $632,000,000 in October and $522,000,000 in November a year ago, while imports were valued at $429,000,000, compared with $402,000,000 in October and $251,000,000 in November, 1918.

For the 11 months of this year, exports were valued at $7,242,000,000 and imports at $3,528,000,000, leaving a trade balance of $3,714,000,000 for the 11 months in favor of the United States. This was $1,000,000,000 greater than the trade balance in the corresponding period.

* * *

Planning To Build Houses for Employees

The Draper Corp., Hopedale, Mass., is planning the erection of several two-story brick houses for its employees. The company plans to rent them at cost to enable the workers to combat with the high cost of living. The Draper Corp. manufactures cotton-mill machinery of all kinds.

* * *

Distributes Bonuses to Employees

The Viscoloid Co., Leominster, Mass., maker of "Viscoloid" sheetings, has distributed about $25,000 among its 1600 employees. This bonus is a yearly gift of the company to the employees and the bonuses ranged from $25 to $200 for each employee, according to the length of service of the employee, his or her present wage and the regularity of attendance at work.

Personals

GEORGE H. SOMMERFIELD has severed his connections as superintendent of the J. C. Ulmer Co., and has started in business for himself.

CHARLES B. ELMORE has been appointed American representative of the firm of J. Horstmann, Paris, France, with offices at 47 West 42nd St., New York.

S. A. SPENCER, assistant purchasing agent of the Graton and Knight Manufacturing Co., Worcester, Mass., maker of factory leather belting, has tendered his resignation.

GEORGE H. SOMMERFIELD, general manager of Hitchcock & Sommerfield, manufacturer of special machinery tools and dies, is now located at 1362 East Third St., Cleveland, Ohio.

E. H. CORNELL has been made manager of the Chicago office of the Graton and Knight Manufacturing Co., Worcester, Mass., and has entered upon his new duties. Mr. Cornell's office is at 34 South Jefferson St., Chicago, Ill.

DON F. KENNEDY, manufacturers' agent of Detroit, for the last four years district sales manager of the Hammond Steel Co., Inc., Syracuse, N. Y., has taken the agency for Michigan and Toledo of the Towmotor Co., Cleveland, Ohio.

E. S. PATCH has resigned his position as production manager of the A. J. Kirstin Co., manufacturer of farm implements, Escanaba, Mich. Mr. Patch is succeeded by L. R. Bowles, formerly of the Barber Coleman Co., Rockford, Ill.

EATON D. SARGENT, treasurer of the Goodspeed Machine Co., Winchendon, Mass., has disposed of his interest in the concern, and will remove to Nashua, N. H., where he has purchased the controlling interest in the White Mountain Freezer Co.

ROBERT KIMBER, formerly representing the Firth-Sterling Steel Co., in its Hudson River, Brooklyn and Long Island territory, has been appointed Eastern sales representative of the Le Moyne Steel Co., with offices at 30 Church St., New York City.

DANIEL P. HARROWER has been appointed employment manager of the Graton and Knight Manufacturing Co., Worcester, Mass., manufacturer of factory belting, etc. Mr. Harrower has been in the employ of the company for about four years in a clerical capacity.

BERT L. WENNERSTROM, 1434 34th St., Rock Island, Ill., has severed his connections with the E. L. Essley Machine Co., Chicago, Ill., as salesman, to take up duties of sales manager for the Anderson Die Machine Co., Bridgeport, Conn., a concern owned by the Fairbanks-Morse Co.

JOSEPH H. S. LYNDE, formerly supervising and safety service engineer of the Worcester Pressed Steel Co., Worcester, Mass., has been appointed safety engineer of the American Tube and Stamping Co., at Bridgeport, Conn. Mr. Lynde has been with the Worcester concern for the past two years.

THEODORE C. GREENE, until recently employed with the Graton and Knight Manufacturing Co., Worcester, Mass., manufacturer of leather belting, where he served as employment manager for several years, is now with the Winchester Repeating Arms Co., New Haven, Conn., in an official capacity.

I. E. SPAULDING, formerly general superintendent of the Fred T. Ley Shipbuilding Corp., Inc., has been appointed general manager of the corporation's Mobile (Ala.) plant to succeed Sidney H. McLane, resigned. Mr. McLane tendered his resignation in order to accept a position as general manager of the Mobile Shipbuilding Co.

EARL E. BERIDGE has been appointed works manager of the Federal Corp., manufacturer of automobile accessories. Mr. Beridge was for 12 years connected with the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., in various capacities. He has also held positions with the New England Westinghouse Co. and the Springfield Aircraft Corporation.

FRED E. LACEY, for the past year sales representative for the American and British Maunfacturing Corp., Bridgeport, Conn., has resigned to accept a position as sales engineer for the Taft-Peirce Manufacturing Co., Providence, R. I. Mr. Lacey will take up his new duties Jan. 1, with headquarters in the Woolworth Building, New York City.

F. S. MONTGOMERY, for the last six years advertising manager for the National Metal Molding Co., Pittsburgh, Penn., and prior to that for several years district manager in charge of the Atlantic office of the same company, has tendered his resignation to take effect Dec. 1. Mr. Montgomery will then become associated with the Ivan B. Nordham Co., 8 West 40th St., New York.

Business Items

The Angsten-Knox Co., 5025 South State St., Chicago, Ill., has moved its plant to Michigan City, Ind.

The St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo., is building an addition to its plant which will give them 13,000 ft. of additional floor space.

C. D. Smith has bought the property of the Fairmont Welding Co., Fairmont, W. Va., and will continue the business under the firm name of the Fairmont Welding Shop.

The Rhode Island Crucible Steel Co., Pawtucket, R. I., has purchased the Fuller property located on South Main and Tockwotton Sts., Providence, and will remove its plant there during the early part of January.

The Nutmeg Crucible Steel Co., Branford, Conn., has been incorporated to manufacture steel and iron castings, iron fittings, etc. The incorporators are Charles Reynolds, E. V. V. Peterson and August Hallden, all of Branford.

The Federal Bearings Co., Poughkeepsie, N. Y., has started construction on an addition to its plant. This new addition is expected to be completed next spring and it will greatly increase factory capacity and production.

The Mosel Manufacturing Co., Kensington, Conn., has been organized to deal in mill supplies, machinery and tools, etc. The incorporators of the new company are F. J. Moran, H. H. Wessel and B. F. Gaffney, all of New Britain, Conn.

Peter A. Frasse & Co., Hartford, Conn., manufacturer of steel products, etc., has been taken over by a new company to be known as the Frasse

Steel Corporation. The new company plans to make additions to the present plant in the future.

The Fenn Manufacturing Co., Hartford, Conn., has been incorporated and will engage in the manufacture of machinery, etc. The incorporators are W. L. Fenn and Wilson A. Fenn, both of Hartford, and S. E. Livingston, of West Hartford, Conn.

The Coe-Stapley Manufacturing Corp., now located at 1555-65 Railroad Ave., Bridgeport, Conn., announces its removal to West Haven, Conn., next January. The company has purchased the plant formerly owned by the Avis Co., gun manufacturers.

The Hill Clutch Co., Cleveland, Ohio, has appointed D. F. Collins as its Eastern representative in charge of its New York office, 50 Church St. Mr. Collins has been connected with the general sales department at Cleveland since receiving his discharge from Government service last summer.

The Audion Phono Co., with offices at 46 Murray St., New York, has changed its name to the Acme Phono Corporation. The corporation has completed its new concrete factory at Boonton, N. J., and has installed new and modern machinery. It will make a specialty of phonograph reproducers and small parts.

The Bridgeport Worm and Gear Manufacturing Co., Bridgeport, Conn., has been incorporated. The company will deal in machinery and parts. The new concern is incorporated by J. N. Bayus, Stratford; Leonard Mainiero, John Hissich, Stephen Erhart, Andrew Demosko, Peter Hibjan and Joseph M. Ondek, all of Bridgeport, Conn.

The Norton Co., Worcester, Mass., manufacturer of grinding machinery, etc., has announced the establishment of a branch factory in Hamilton, Ont., Can., to supply British and Canadian trade. The company has purchased a four-acre plat of land and is building a factory on this site which is expected to be completed early next February.

Wolfs' New Process Abrasive Wheel, Inc., of Meriden, Conn., has been incorporated to manufacture a new process wheel product. The officers of the new concern are Rudolph Wolf, president and treasurer; Carl Wolf, vice president; F. H. Mantler, secretary. Rudolph Wolf is the inventor of the new product. The company's address is 711 Hanover Street.

The business of the Carlson-Wenstrom Co. and the Carwen Steel Tool Co., Erie Ave. and Richmond St., Philadelphia, will be continued by A. H. and F. H. Lippincott, manufacturers of screw-machine products, who have purchased the assets of these two companies and under their supervision will manufacture the Carwen dynamic balancing machine and various classes of special machinery in conjunction with their screw-machine products. The business will be conducted under the corporate name of Lippincott-Carwen Corporation. Joseph A. Ganster will be associated with the corporation as director and works manager, and Jacob Lundgren as engineer.

Obituary

EUGENE L. CUSHMAN, chairman of the board of directors of the Cushman Chuck Co., and a prominent citizen of Hartford, Conn., died at his home, 695 Prospect Ave., on Dec. 17, after an illness of about eight months following an attack of influenza. He was born in Belchertown, Mass. He received his early education in the public schools of Hartford. In 1870 he became associated with his father in business. He had devoted his life to the Cushman Chuck Co. since he was 14 years old. The Cushman Chuck Co. was founded by Mr. Cushman's father in 1862 and the business was incorporated in 1885. Mr. Cushman's father died Nov. 28, 1914.

Export Opportunities

A large company in England with a branch office here for the purpose of looking after shipments and completing purchasing transactions, etc., desires to be placed in touch with manufacturers of mechanical and electrical labor-saving appliances, with a view to their sale in the United Kingdom. It is particularly interested in washing machines, vacuum cleaners, dish washing machines, electrical clothes driers, motor-driven sewing machines, electrical water-heating apparatus, automobile accessories, automobile tires and shoes, electrical fixtures and fittings and good saleable novelties suitable for trade in the United Kingdom. Articles of the higher class and in large quantities are wanted.—Communicate with Chas. H. Champion, purchasing agent, 347 Fifth Ave., New York.

Trade Catalogs

Take It to Taft-Pierce. Taft-Pierce Manufacturing Co., Woonsocket, R. I. Bulletin No. 108, pp. 47, 10½ x 8 in. This bulletin gives a brief description of its contract service plant, also several illustrations of its machines and equipment.

Bearing Hangers. Hyatt Roller Bearing Co., New York City. Bulletin No. 125, pp. 19, 11 x 8½ in. This bulletin gives complete engineering data of its roller bearings for use on line shafting; dimensions and list prices are also included.

Putting Mettle into Metal. Clark Equipment Co., Buchanan, Mich. Booklet, pp. 32, 7 x 10½ in. This booklet is an excellent example of the printer's craft. It is embossed and printed in colors on excellent coated stock. The first page gives an illustration of the "Celfor" drill manufactured by this company, following, which are many fine halftone illustrations of the various plant buildings, employees' homes, hospital, theater, laboratory. There are several pages devoted to a description of the illustrations and the "Celfor" drills.

Stock List. Frank Toomey, Inc., 127-131 North Third St., Philadelphia, Penn. Catalog, 9 x 6 in.; gives a stock list of its new and used steam and electrical equipment, machine tools and metal woodworking machinery.

Heat Insulation. The Franklin Manufacturing Co., Franklin, Penn. Catalog F. C. 7-19, pp. 77, 11¼ x 8 in. This catalog contains brief and uncolored descriptions of its products; also useful engineering information. Complete tables and concise instructions for its use are given.

Self-Opening Die Heads and Collapsible Taps. The Eastern Machine Screw Corp., New Haven, Conn. Catalog, pp. 96, 9 x 6 in. It is profusely illustrated and replete with threading information; also tables pertaining to screw cutting. The company has issued a complete price list of its die heads.

Single-Phase Motors. Wagner Electric Manufacturing Co., St. Louis, Mo. Bulletin No. 118, 8 x 10½ in., pp. 8, illustrated. The company's line of single-phase motors is described; some photographs are shown of the motors operating different types of machinery.

Manufacture and Advantage of "National" Welding Scale-Free Pipe. National Tube Co., Pittsburgh, Penn. Bulletin No. 7, 8½ x 11 in., pp. 14, illustrated. The manufacture and the advantages of the pipe are clearly described and illustrated. There also are briefs of all the other bulletins issued by the company.

Cutler-Hammer Drum Controllers. Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Folder, 8½ x 11 in., illustrated. This folder gives prominence to the outstanding features of the C-H drum controller.

Manual of Electrical Testing. The Wagner Electric Manufacturing Co., St. Louis, Mo. Bulletin No. 120, 10½ in., pp. 20, illustrated. This bulletin describes various electrical testing methods, using illustrations. A list of the other bulletins issued by the company is also included.

Milliken Buildings. Milliken Brothers Manufacturing Co. Inc., Woolworth Building, New York City. Catalog, Nos. 10 and 11, size 11 x 8½ in. No. 10, "Choice of a Thousand Buildings," has 44 pages in which are set forth detailed information and illustrations covering the general appearance of the Milliken building, giving dimensions, sash and door arrangements, prices, shipping weights, etc. No. 11, "Erection Handbook," is published as a supplement to catalog No. 10 and has 32 pages. It contains complete foundation plans, erection diagrams, construction details and directions for erecting buildings.

Forthcoming Meetings

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia, Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

The motor-truck sections of the 20th Annual Automobile Shows of 1920 will hold an exhibition in the 8th Coast Artillery Armory, New York, Jan. 3 to 10, 1920, and in the International Amphitheatre, Chicago, Ill., Jan. 24 to 31, 1920.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Society of Automotive Engineers will hold its annual meeting in New York on Jan. 6 to 8, inclusive. For further information of program, address the meeting committee, 239 West 39th St.

Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Angle Plates, Universal

The Nelson Tool and Machine Co., Newark, N. J.

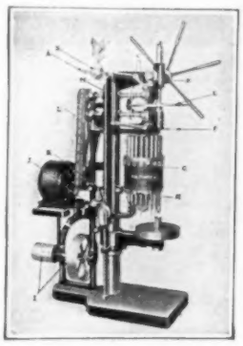
"American Machinist," Sept. 18, 1919

The universal angle plate made by this company differs from the small toolmaker's universal angle plate and the 6 x 9 universal angle plate formerly produced by the Nelson Tool and Machine Co. The new line covers three sizes: 7½ x 9 in., 10 x 12 in. and 14 x 18 in. A wormwheel provides a vertical swivel adjustment up to 90 deg. Vertical locking is accomplished by two ¾-in. bolts. The angle plate also swivels horizontally through a complete circle, a graduated collar being on the base for this purpose. One of the features is that in no position does the table overhang the base.

Drilling Machine, Multiple-Spindle Magazine

The Lima Drill Press Co., Lima, Ohio.

"American Machinist," Sept. 18, 1919

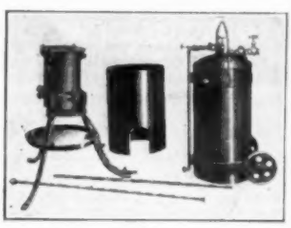


Height, 42 in.; base, 11 x 28 in.; floor space, 14 x 28 in.; diameter of column, 2⅞ in.; net weight, 160 lb.; table diameter, 7 in.; vertical movement of table, 8½ in.; lateral movement of table, 12 in.; magazine diameter, 6 in.; magazine length, 5½ in.; number of spindles in magazine, 16; length of drill and spindle combined, 11½ in.; vertical movement of drill, 2½ in.; drills, 1/16 to 1/4 in.

Furnace, Rivet-Heating

The Liberty Tool Co., Munsey Building, Baltimore, Md.

"American Machinist," Sept. 18, 1919

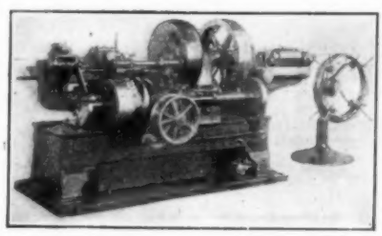


The rivet heater is portable and of light construction. The burner is located in the body of furnace and is provided with a cast-iron trap to catch drippings of oil that may occur in lighting the burner. In service the burner is usually surrounded by the metal jacket which increases its safety and prevents a flickering blaze. For heating rivets a plate is placed on top of the furnace which is punched full of holes to permit the rivet to enter as far as the head, and prevent the head from being burned.

Swaging Machines, Wire-Spoke

The Langelier Manufacturing Co., Providence, R. I.

"American Machinist," Sept. 25, 1919

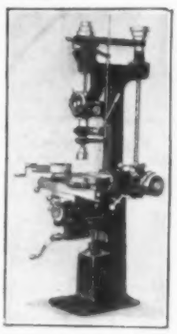


For making wire spokes for automobile wheels. Straightens, swages and cuts off wire. Machine takes wire of 0.176-in. diameter and reduces it to 0.156-in. diameter between butts. Cuts lengths from 8½ to 12 in.; capacity, three spokes per minute.

Drilling, Tapping and Milling Machine

The Demco Mechine Tool Co., 706 Frankfort Ave., N. W., Cleveland, Ohio.

"American Machinist," Sept. 18, 1919

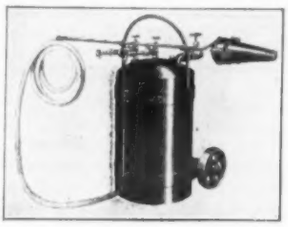


Diameter of spindle, ¾ in.; taper hole in lower end of spindle, No. 7 B. & S.; maximum capacity for drilling, ¾ in.; maximum capacity for tapping, ½ in.; traverse of spindle, 8 in.; traverse of feed rack, 4 in.; spindle drive cone diameters, 3, 4, 5 and 6 in.; width of belt, 1¼ in.; number of speeds, 18, maximum spindle speed, 2000; minimum spindle speed, 200; number of open belt speeds, 4; number of back geared speeds, 4; maximum distance spindle to table, 16 in.; minimum distance spindle to table, 0 in.; from column to center of spindle at gap, 8 in.; speed of countershaft, 1000; diameter of drive pulley, 6 in.; working surface of table, 8 in. x 24 in.; longitudinal movement of table, 16 in.; transverse movement of table, 8 in.; vertical movement of table 12 in.; floor space required, 44 in. x 52 in.; height, 6 ft. 4 in.; drill chuck capacity, 1/16 in. to ¾ in.; diameter of circular attachment, 12 in.; weight crated, 1200 lb.

Torches, Rivet-Heating

The Liberty Tool Co., Munsey Building, Baltimore, Md.

"American Machinist," Sept. 18, 1919

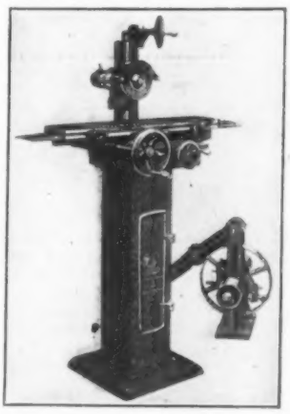


For use on heavy work in connection with railway and similar shops. The torch is operated from the tanks with only one line of hose leading to the burners. Compressed air from an outside source is employed to give the desired pressure of oil in the burner, and the single hose line to the burner makes it convenient to handle. The torch will heat to any desired temperature and can be used in the open air with excellent results.

Grinding Machine, Surface

Draper & Hall Co., Middletown, Conn.

"American Machinist," Sept. 18, 1919.

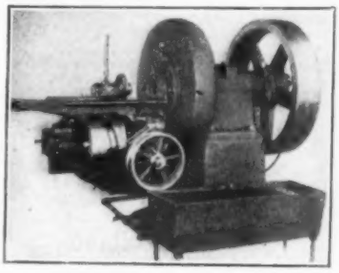


The sliding table has no overhang, being supported its entire length by the longitudinal slide. The table is 30 x 6½ in., has a working surface of 17 x 6 in. and contains three T-slots ⅝ in. in width. The lever can be turned down to permit the table to be moved past the stops without changing the dogs. The spindle runs in tapered phosphor-bronze boxes. The end is tapered to take wheels 6 in. in diameter, ½ in. thick with 1¼-in. hole. Range, long 17 in., cross 6 in., vertical, 8½ in.; weight, 750 lb.

Swaging Machines, Valve-Stem

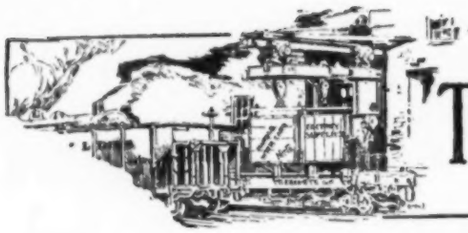
The Langelier Manufacturing Co., Providence, R. I.

"American Machinist," Sept. 25, 1919



For swaging stems of poppet valves, used on gas engines. Has automatic feed and hand-operated chuck. Will turn out work ready for finish-grinding at the rate of 1½ valves per minute.

Patented Aug. 20, 1918



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$36.60	$36.60
Northern Basic	34.00	34.00
Southern Ohio No. 2	36.55	36.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	39.40	39.40
Southern No. 2 (Silicon 2.25 to 2.75)	41.40	41.40
BIRMINGHAM		
No. 2 Foundry	33.00	33.00
PHILADELPHIA		
Eastern Pennsylvania No. 2	38.10*	38.10*
Virginia No. 2	39.10*	39.10*
Basic	34.60†	34.60†
Grey Forge	34.60*	34.60*
CHICAGO		
No. 2 Foundry local	36.25	36.25
No. 2 Foundry, Southern	38.00	38.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	.....	.....
Basic	34.40	34.40
Bessemer	35.40	35.40

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.27	$3.62	$4.17	$3.47	$4.27
Soft steel bars	3.52	3.52	4.17	3.52	4.17	3.52	4.17
Soft steel bar shapes	3.52	3.52	4.17	5.50	4.17	3.52	4.17
Soft steel bands	4.22	4.22	4.77	.....	.....	.....	.....
Plates, ¼ to 1 in. thick	3.67	3.67	4.52	3.82	4.42	3.67	4.25

Note—For less than carload lots, add 4½c. per 100 lb.

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, N. Y.	$3.10	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	4.67
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Mill Carloads, Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 28 black	$4.35–4.85	$7.00–8.90	$6.52	$5.77	$6.00
No. 26 black	4.25–4.75	6.90–7.90	6.42	5.67	5.90
Nos. 22-24 black	4.20–4.71	6.85–7.85	6.37	5.62	5.85
Nos. 18-20 black	4.15–4.65	6.80–7.80	6.32	5.57	5.80
No. 16 blue annealed	3.75–4.20	6.02	5.72	5.17	5.02
No. 14 blue annealed	3.65–4.10	5.92	5.62	5.07	4.92
No. 10 blue annealed	3.55–4.00	5.50–6.00	5.52	4.97	4.82
No. 28 galvanized	5.70–6.20	7.50–9.00	7.77	7.12	7.25
No. 26 galvanized	5.40–5.90	7.20	7.47	6.82	6.95
No. 24 galvanized	5.25–5.75	7.05	7.32	6.57	6.52

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.00	$4.90	$5.00
Flats, square and hexagons, per 100 lb. base	5.50	5.40	.....

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	55
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$25.30
Cleveland	20.00	20.00
Chicago	16.50	19.00

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
5/32, 11/64, 3/16, 1/4, 5/16, 3/8, No. 8, 7/16 and No. 10	21.00 to 30.00	3/16 by 12 in. long	14.00
1/2		1/4 by 19 in. long	12.00
No. 12		5/16 by 19 in. long	10.00
7/16, No. 14 and 1/8		3/8 by 21 in. long	10.00
No. 18		Special Welding Wire, Coated	
No. 20		1/4	33.00
Domestic 20c. for 1/16, 15c. for 1/8 to 1/4		5/16	30.00
		1/2	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	10.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	4.75	4.07
Cold-rolled strip steel	8.40	8.25	7.50
Floor plates	5.67	6.00	5.92

Note—For less than carload lots, add 4½c. per 100 lb.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
1/8, 1/4 and 3/8	50%	24%	3/8 to 1 1/4	30%	23 1/2%
1/2	54 1/2%	40%			
3/4 to 3	57 1/2%	44%			

LAP WELD

2	50 1/2%	35%	2	32 1/2%	18 1/2%
2 1/2 to 6	53 1/2%	41%	2 1/2 to 6	34 1/2%	21 1/2%

BUTT WELD, EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	46 1/2%	29%	3/8 to 1/2	39 1/2%	24 1/2%
1/2	51 1/2%	39%			
3/4 to 1 1/2	55 1/2%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48 1/2%	37%	2	33 1/2%	20 1/2%
2 1/2 to 4	51 1/2%	49%	2 1/2 to 4	.....	23 1/2%
4 1/2 to 6	50 1/2%	39%	4 1/2 to 6	34 1/2%	22 1/2%

Stock discounts in cities named are as follows:

	Black	Galv.	Black	Galv.	Black	Chicago Galv.
3/8 to 3 in. steel butt welded	47%	31%	43 1/2%	34 1/2%	57 1/2%	44%
2 1/2 to 6 in. steel lap welded	42%	27%	45 1/2%	39 1/2%	53 1/2%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 12 1/2% less 5%. Cast iron, standard sizes, 10–5% off.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.00	18.25	23.00
Tin in 5-ton lots	55.00	54.00	72.00
Lead	7.25*	6.75	6.50
Spelter	8.625	8.45	8.40
ST. LOUIS			
Lead	6.35	6.25	6.15
Spelter	8.10	8.10	8.05

* Lead scarce in New York market.

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

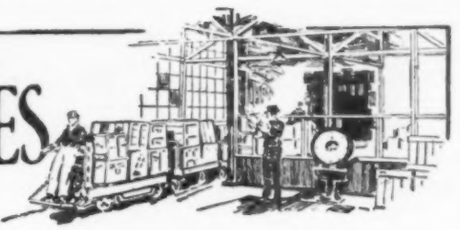
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	28.50	28.50	38.00	29.50–31.00	38.00	35.00	36.00
Copper wire (carload lots)	28.00	28.00	35.00	28.50	35.00	26.00	33.00
Brass sheets	25.50	25.50	39.75	28.00	30.50	26.00	33.50
Brass pipe	30.50	30.50	46.00	34.00	42.50	34.00	44.00
Solder (half and half) (case lots)	35.00	35.00	55.00	35.50	47.50	33.00	56.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	22.75	36.00
New York	24.00	38.40
Cleveland	28.00	38.50
Chicago	25.00	29.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 11.50

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	11.50	18.75	12.00	21.50
New York	13.00	17.00	13.50	20.25
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	9.75-10	9.50-10.50
Chicago	9.50	10.00
Cleveland	11.75	11.625

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy and crucible	17.50	18.00	18.50	21.00	16.50
Copper, heavy and wire	15.50	17.00	19.00	21.00	16.25
Copper, light and bottoms	13.50	15.00	15.50	19.00	15.25
Lead, heavy	6.25	5.00	6.25	6.00	6.00
Lead, tea	5.00	4.00	4.25	5.00	5.00
Brass, heavy	9.00	9.50	13.25	14.50	16.00
Brass, light	8.00	8.50	9.75	11.50	9.50
No. 1 yellow brass turnings	9.50	10.00	11.50	13.50	10.00
Zinc	5.00	5.00	5.00	5.50	6.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00c.	32.00c.@3.00c.	33½c.

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	34.00	40.00
Chicago	28.00	40.00
Cleveland	31.00	33.50

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	70.00	80.00	60.00	75.00
Commercial	55.00	42.00	16.50	21.50	13.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square, List	.80	$1.00	$1.25	$1.45	.98	
Hot pressed hexagon List	.80	1.00	1.05	1.45	.78	
Cold punched hexagon List	2.50	1.00	.75	1.05	1.00	
Cold punched square List	2.50	1.00	.75	1.05	1.00	

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70-5%	50-10%
Chicago	50%	50%
Cleveland	60-10%	50-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35-5%
Larger and longer up to 1¼ in. by 30 in.	20%	40%	25-5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.25 Cleveland..... $3.75 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	25%	40-5%	30%
Larger and longer up to 1 in. by 30 in.	15%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse.:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	30%	List plus 10%	30%	List plus 10%
Chicago	20%	List price	20%	List plus 20%
New York	30%	15% from list	10%	List plus 5%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	50%	55% off	50%
Tinned	50%	55% off	50%

Boiler, ¾, ⅞, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.00 Cleveland...$4.00 Chicago....$4.87 Pittsburgh...$4.72

Structural, same sizes:

New York...$5.10 Cleveland...$4.10 Chicago....$4.97 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	32.00	36.00	35.00
Brass	30.50	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock-sizes being considered as ⅛-2 in. inclusive in rounds, and ⅛-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00-13.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50-12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13¼	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.625
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.625	3.875	4.25
Chicago	4.12½	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Dec. 9	Dec. 2	Nov. 9
Prompt furnace	$6.00	$6.50	$6.00
Prompt foundry	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.90	$1.59	$1.77	$1.90
5-gal. cans	2.10	1.84	1.97	2.00

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.00	16.10	14.00	14.50	14.00	14.00
25 and 50-lb. kegs	14.25	15.75	14.25	14.75	14.25	14.25
12½-lb. keg	14.50	16.00	14.50	15.00	14.50	14.50
5-lb. cans	16.00	17.50	.....	.....	16.00	16.00
1-lb. cans	17.00	18.50	.....	.....	17.00	17.00

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discout.

Consult the Buying Section when in need of machinery or supplies

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The Bryant Electric Co., 1421 State St., manufacturer of electrical specialties, will build a 1 story, 60 x 117 ft. garage. Estimated cost, $25,000.

Conn., Hartford—The Hartford Fairmont Co., 41 Arch St., will soon award the contract for the construction of a factory, for the manufacture of machinery. Estimated cost, $65,000. Ford, Buck & Sheldon, Inc., 60 Prospect St., Arch.

Conn., Hartford — The Merrow Machine Co., 28 Laurel St., manufacturers of overseam machinery, etc., has purchased a site on Riverside St., and plans to build an addition to its plant.

Conn., Hartford—The Royal Typewriter Co., Inc., 150 New Park Ave., has awarded the contract for the construction of a concrete foundation for a 5 story, 50 x 70 ft. and 50 x 310 ft. factory.

Conn., New Britain—Landers, Frary & Clark, Commercial St., manufacturer of cutlery and electrical devices, has awarded the contract for the construction of a 6 story, 80 x 160 ft. factory, a 1 story, 46 x 155 ft. storage house, a 3 story, 40 x 68 ft. tempering building and a 1 story, storage house. Total estimated cost, $189,500.

Conn., New Haven—W. Shollhorn & Co., Hamilton St., manufacturer of tools, has awarded contract for a 4 story, 40 x 140 ft. factory and office. Estimated cost, $84,000.

Mass., Boston—The Rivett Lathe & Grinder Co., Newton St., Brighton Dist., has awarded the contract for the construction of a 3 story, 60 x 200 ft. factory. Estimated cost, $100,000.

Mass., East Boston (Boston P. O.)—I. Young & Co., 87 Border St., (coppersmiths), has awarded the contract for the construction of a 2 story, 74 x 80 ft. factory. Estimated cost, $28,000.

Mass., Taunton—A. Lincoln, 10 Spring St., has awarded the contract for the construction of a 1 story, 50 x 150 ft. machine shop. Estimated cost, $20,000.

Mass., Worcester—The Olson Manufacturing Co., 54 Commercial St., manufacturer of screw machine products and specialties, has purchased a site, on Barber and Wiley Ave., and plans to build a factory.

Mass., Worcester — The Sanford Riley Stoker Co., 25 Foster St., manufacturer of mechanical stokers, has purchased a 7 acre site on West Boylston St. and plans to build a large addition to its plant.

N. H., Nashua—H. C. Lintott, 25 Main St., is having plans prepared by W. H. Taylor & Son, Arch., 50 Bromfield St., Boston, Mass., for the construction of a 2 story, 75 x 150 ft. garage. Estimated cost, $60,000.

R. I., Providence — The Federal Truck Sales Co., 276 West Exchange St., plans to build a 1 story, 96 x 320 ft. service station on Reservoir Ave. Estimated cost, $100,000.

R. I., Providence—The Gorham Manufacturing Co., Reservoir Ave., (silversmiths), has awarded the contract for the construction of a 1 story, 30 x 120 ft. addition to its factory, on Adeliade Ave. Estimated cost, $15,000.

MIDDLE ATLANTIC STATES

N. J., Trenton—W. H. Baker, 458 Norway Ave., will build a 50 x 60 ft. machine shop, on Ward Ave. Estimated cost, $5000.

N. Y., Manlius—S. Cheney & Son will build a 1 story, 80 x 200 ft. and a 1 story, 70 x 88 ft. foundry on West Seneca St. Estimated cost, $15,000.

N. Y., Massena—J. Dunlop Sons Co., 19 Madison Ave., New York City, has purchased two foundry buildings on East Orms St. and plans to alter and construct additions to same, also install silk manufacturing machinery. Estimated cost, $100,000. A. L. Brockway, 3rd Natl. Bank Bldg., Syracuse, Arch.

N. Y., New York (Borough of Bronx)—W. C. Berger, 130 West 180th St., has awarded the contract for the construction of a 1 story, 80 x 107 ft. garage and a 2 story, 50 x 97 ft. addition to its woodworking factory, on 176th St. and Park Ave. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—Ascutney Realty Co., 1721 Ave. J., will build a 1 story, 100 x 125 ft. machine shop on East 7th St. and Foster Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—Callan Bros., 214 East 135th St., New York City, will build a 2 story, 85 x 200 ft. garage on 19th St. and 3rd Ave., here. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—J. Hirn, 1473 Gates Ave., will build a 1 story addition to his garage on Gates and Irving Ave. Estimated cost, $16,000.

N. Y., New York (Borough of Manhattan)—The Connelly Iron Sponge & Governor Co., 227 Fulton St., has awarded the contract for the construction of a 1 story factory. Estimated cost, $20,000.

N. Y., New York (Borough of Manhattan)—The Flush-Becker Improvement Co., 391 Christopher St., will build 1 story, 100 x 125 ft. garage on 19th St. and 10th Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—The Hawkstone Garage, Inc., 115 Broadway, will build a 2 story, 61 x 136 ft. garage, on Hawkstone St. and Walton Ave. Estimated cost, $10,000. B. W. Leviton, 7 West 45th St., arch.

N. Y., New York (Borough of Manhattan)—Park & Tilford, 529 West 42nd St., will soon award the contract for the construction of three 2 story, 75 x 100 ft. garages at 537 West 43rd St. Estimated cost, $60,000. N. Weinberger, 154 Nassau St., Arch. and Engr.

N. Y., Redwood—Kabel Brothers plan to build a garage.

N. Y., Rochester—Co-operative Foundry Co., Lincoln Ave., plans to build 1 story, 36 x 140 ft. factory, at Lincoln Park. Estimated cost, between $15,000 and $18,000.

N. Y., Rochester—The National Fire Escape Corporation, recently incorporated with $250,000 capital stock, plans to build an assembling plant. Estimated cost, $150,000. G. Webster, Rochester, interested.

N. Y., Rochester—The Rochester Motors Co., 609 Driving Park Ave., plans to build a 1 story addition to its factory. Estimated cost, $60,000.

N. Y., Utica—The Foster Bros. Spring Bed Manufacturing Co., 807 Broad St., plans to build a 2 story, 40 x 75 ft. addition to its factory. Estimated cost, $20,000.

Penn., Ardmore — E. Freed, 128 Mill Creek, is having plans prepared by Savery & Scheetz, Arch., Stephen Girard Bldg., Philadelphia, for the construction of a 2 story garage, on Stephen Girard Rd. Estimated cost, $10,00.

Penn., Kingston—Wales Adder Machine Co., Walnut and Hoyt St., plans to build 3 story, 100 x 100 ft. factory, on Hoyt St. Estimated cost, $100,000.

Penn., Philadelphia — The Neel-Cadillac Co., 144 North Broad St., is having plans prepared by C. E. Oelschlager, arch., 1615 Walnut St., for the construction of a sales and service station, on 25th and Parkway St. Estimated cost, $800,000.

Penn., Philadelphia—G. C. Williams, 613 North 34th St., has awarded the contract for the construction of a 1 story, 67 x 185 ft. addition to his garage, on Pentridge and 57th St. Estimated cost, $25,000.

Penn., Wilkes-Barre—J. L. Johnson, Ross St., plans to build a 2 story, 50 x 150 ft. machine shop and welding shop, on Ross and Gildersleeve St. Estimated cost, $45,000.

Penn., Wissinoming—The Tabor Manufacturing Co., manufacturer of molding machines, has awarded the contract for altering and building a 1 story, 100 x 107 ft. addition to its factory and office, on State Rd. Estimated cost, $50,000.

SOUTHERN STATES

Ga., Atlanta—The Lanham Cotton Cultivator Co., 425 Empire Bldg., manufacturer of cotton chopper-cultivators, is building a 2 story, 32 x 70 ft. office building, a 75 x 140 ft. machine shop, a 50 x 100 ft. forge shop, a 70 x 100 ft. foundry, a 28 x 56 ft. wood shop, and a 35 x 100 ft. storage shed. Estimated cost, $100,000.

Md., Baltimore — S. Friedberg, Norfolk, Va., has awarded the contract for alterations to his 3 story, 100 x 130 ft. garage and store, at 602-4-6-8 and 10 North Howard St., here. Estimated cost, $60,000.

MIDDLE WEST

Ill., Chicago—Cadillac Automobile Co., 2301 South Michigan Ave., has awarded the contract for the construction of a 6 story, 100 x 160 ft. repair shop, on 23rd St. and Indiana Ave. Estimated cost, $500,000.

Ill., Chicago — The Gramm - Bernstein Motor Truck Co., 2438 South Michigan Ave., will soon award the contract for the construction of a 2 story, 70 x 190 ft. factory, at 2439 Wabash Ave. Estimated cost, $150,000. P. F. Olsen, 127 North Dearborn St., arch.

Ill., Chicago — The Guyton & Cumfer Manufacturing Co., 4451 Fillmore St., has awarded the contract for the construction of a 2 story, 60 x 130 ft. machine shop, at 4430 Fillmore St. Estimated cost, $60,000.

Ill., Chicago—The Packard Motor Car Co., West Grand Blvd., has awarded the contract for the construction of a 2 story, 298 x 304 ft. factory, on West 37th St. and Princeton Ave., for the manufacture of automobiles.

Ill., Chicago—The Playerphone Talking Machine Co., 338 North Kedzie Ave., has awarded the contract for the construction of a 3 story, 110 x 160 ft. factory, on Lake St. and Kildare Ave., for the manufacture of phonographs. Estimated cost, $110,000.

Ill., Cicero—Hubbard & Co., 306 South Wabash Ave., Chicago, manufacturer of hardware, has awarded contract for a plant to consist of six 1 or 2 story buildings, covering area of 200 x 565 ft., on 12th St. and 54th Ave. Estimated cost, $350,000.

Ind., Indianapolis — The Van Briggle Chemical Co., 429 North Capitol Ave., plans to build a 3 story, 160 x 200 ft. factory and display room, on 16th and Capitol Ave. Estimated cost, $125,000.

Mich., Bay City—The C. R. Wilson Body Co., 26th and Farragut St., manufacturer of automobile bodies, has awarded the contract for the construction of a 1 story, 100 x 316 ft. factory. Estimated cost, $450,000.

Mich., Detroit—J. Kalbfleisch, 293 Commonwealth Ave., has awarded the contract for the construction of a 2 story, 60 x 100 ft. laundry on McGraw Ave. Estimated cost, $45,000.

Mich., Detroit—Shadt & Mathewson, 132 East Lafayette St., has awarded the contract for the construction of a 3 story, 30 x 56 ft. factory, for the manufacture of feather products. Estimated cost, $15,000.

Mich., Grand Rapids—The Berkley & Gay Furniture Co., Monroe Ave., has awarded the contract for the construction of a 5 story, 160 x 220 ft. factory and office building. Estimated cost, $400,000.

Mich., Saginaw—The Saginaw Table and Cabinet Co., Wheeler St., is having plans prepared by Cowles & Mutscheller, Arch., Saginaw, for a 2 story, 61 x 475 ft. furniture factory. Estimated cost, $100,000.

Ohio, Carey—The Carey Tire and Rubber Co. has awarded the contract for the construction of a 3 story, 80 x 160 ft. factory. Estimated cost, $150,000.

Ohio, Cleveland—The Colonial Woolen Mills Co., 6409 Barberton Ave., will soon award the contract for the construction of a 4 story, 100 x 110 ft. factory. Estimated cost, $80,000. J. N. Hahn, Pres. W. S. Louger, Marshall Bldg., arch.

Ohio, Cleveland — The Harshaw-Fuller-Goodwin Co., Newburg Ave., has awarded the contract for the construction of a 1 story, 85 x 160 ft. chemical factory and warehouse. Estimated cost, $30,000.

Ohio, Mt. Vernon—The Knox Tire and Rubber Co. has awarded the contract for the construction of a 3 story, 100 x 225 ft. factory. Estimated cost, $150,000.

Ohio, Newark—The Parish Rubber Co. has awarded the contract for the construction of a 2 story, 110 x 180 ft. factory, for the manufacture of rubber. Estimated cost, $100,000.

Ohio, Troy—The Standard Oil Co. plans to build a 1 story, 18 x 22 ft. gas and oil station on Main and Cherry St. Estimated cost, $20,000.

Wis., Green Bay—The J. Hokery Paper Co., Elm St., plans to build a 4 story, 60 x 250 ft. paper mill on 12th and Main St. Estimated cost, $250,000.

Wis., Madison—Madison Kipp Lubricating Co., Waubesha St., has awarded contract for 52 x 240 ft. addition to shop. Estimated cost, $200,000.

Wis., Saukville—H. J. Cary is forming a company which plans to build a 1 and 2 story, 36 x 376 ft. pea cannery. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Ia., Des Moines—Granette Products Co., 725 2nd St., has awarded the contract for the construction of an 80 x 120 ft. factory, on 9th and Murphy St., for the manufacture of ornamental concrete products. Estimated cost, $30,000.

Ia., Iowa Falls—Swift & Co., 76 West Monroe St., Chicago, Ill., will soon award contract for a 3 story, 100 x 140 ft. produce house. Estimated cost, $150,000. Private plans.

Ia., Sioux City—Grain Belt Cereal Co. has awarded the contract for a 2 sory, 80 x 125 ft. factory and 25,000 bu. grain storage plant. Estimated cost, $150,000.

Ia., Sioux City—The Fairmont Creamery Co., 12th and Jones St., has awarded the contract for the construction of an 8 story, 75 x 150 ft. creamery. Estimated cost, $200,000.

Kan., Wichita—The Red Star Milling Co., 1901 Emporia St., plans to build a 9 story, 60 x 170 ft. mill, a 3 story, 60 x 96 ft. warehouse, a 60 x 61 ft. headhouse and 6 to 20 ft. tanks, 90 ft. high. Estimated cost, $750,000. Sherman Engineering Co., 1019 New York Life Bldg., Kansas City, Mo., Engr.

Minn., St. Paul—The Board of Education is having plans prepared by C. A. Hausler, Arch., City Hall, for the construction of a 3 story, 197 x 272 ft. junior high school, on westside, to include domestic science and manual training departments, etc. Estimated cost, $450,000.

Minn., St. Paul—The United States Bedding Co., Arundel and Minnehaha Ave., has awarded the contract for the construction of a 2 story, 124 x 225 ft. factory, on Minnehaha and Western Ave. Estimated cost, $85,000.

Mo., St. Joseph—The Western Tablet Co., 11th and Mitchell Sts., has awarded the contract for the construction of a 6 story, 141 x 157 ft. factory. Estimated cost $250,000.

Mo., St. Louis—The Sugar Products Co., 16 Exchange Pl., has awarded the contract for the construction of a molasses storage plant on Tessen and Van Buren St., here. Estimated cost, $125,000.

Tex., Breckenridge—The Texas Co., 17 Battery Pl., New York City, has awarded the contract for the construction of a compression and an absorption plant, here. Estimated cost, $150,000.

Tex., Corsicana—The Corsicana Oil and Refining Co. plans to build a refinery. Estimated cost, $300,000. W. M. Elliott, Engr.

Tex., Houston—Miller Bros., Jackson and Preston Ave., have awarded the contract for the construction of a 3 story factory, for the manufacture of slickers and overalls. Estimated cost, $48,600.

WESTERN STATES

Calif., San Pedro—The Van Camp Sea Food Co., 14h St. and waterfront, will probably be granted a lease by City Harbor Comn. on 30 acres of tideland upon which it plans to erect ice and cold storage plant and wharf, 250 ft. long. Total estimated cost, $300,000.

Ore., Portland—The North Portland Box Co., North Portland St., plans to build a 2 story, box factory. Estimated cost, $20,000.

Ore., Vale—The Idaho Mutual Sugar Co. has acquired a 4000 acre site for beet growing and plans to build a 2 or 3 story factory on Dead Ox Flat. Estimated cost, $1,000,000.

Ore., Wallowa—The Wallowa Pine Lumber Co. recently incorporated with $350,000 capital stock plans to purchase 100,000,000 ft. of timber on Bear Creek, and build a 2 story saw mill. Estimated cost, $300,000.

Wash., Seattle—The Board of Education, Central Bldg., plans to build a 3 story, 250 x 250 ft. factory on 8th and Dexter St., for the manufacture of school furniture, laboratory equipment and special furniture. Estimated cost, $160,000.

Wash., South Bend—The Getchell Shingle Co., has purchased a 150 ft. site and plans to build a 1 story, 100 x 150 ft. addition to its shingle mill. Estimated cost, $8000.

CANADA

Ont., Hamilton—The Firestone Tire and Rubber Co., South Main St., is having plans prepared by B. H. Prack, Arch., Lumsdem Bldg., Toronto, for the construction of a 1 story factory, for the manufacture of rubber tires. Estimated cost, $1,500,000.

Ont., Hamilton—The Firestone Tire and Rubber Co., South Main St., Akron, Ohio, will soon award the contract for the construction of a 5 story, 100 x 250 ft. factory on Barton St., here. Estimated cost, $350,000. B. H. Prack, 50 Bay St., Toronto, arch.

Ont., Yhoroed—The Beaver Board Co., manufacturer of beaver board, has awarded the contract for the construction of a 3 story, 60 x 80 ft. factory. Estimated cost, $75,000.

Que., Montreal—The Barrett Manufacturing Co., Ltd., 2021 St. Hubert St., manufacturer of roofing materials, has awarded the contract for the construction of a 1 story, 100 x 200 ft. factory, on Des Carrieres St. Estimated cost, $30,000.

Que., St. Hyacinthe—E. H. Richer plans to build a 4 story, 175 x 225 ft. cotton factory, on Joli St. Estimated cost, $200,000.

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools:

N. J., Newark—The Slocum-Abom-Slocum Laboratories, Inc., 120 Pacific St.—horizontal drilling machine, capable of handling 2 couster drill heads with 3⅜ in. drills.

N. Y., New York (Borough of Manhattan)—A. Stroud, 120 Liberty St.,—48 or 52 in. boring mill and a model C. Becker vertical milling machine, for export. (used.)

N. Y., New York (Borough of Manhattan)—The Transit Equipment Co., 591 5th Ave.—car wheel lathe, having 42 ft. swing with about 12 ft. bed.

N. Y., Redwood—Kabel Brothers,—small machine tools for motor and truck repair.

N. Y., Utica—The Foster Bros. Spring Bed Manufacturing Co., 807 Broad St.,—cupola (new).

Penn., Ardmore—E. Freed, 128 Mill Creek—pumps and tanks.

Penn., Ardmore—The Lower Merion School Dist.—pumps and tanks.

Penn., Philadelphia—The Lanston Monotype Machine Co., 24th and Locust St.—four No. 2 Browne & Sharpe surface grinders. Two No. 00 Browne & Sharpe automatic screw machines. Three No. 0 Browne & Sharpe automatic screw machines. Four No. 2 Browne & Sharpe automatic screw machines (new).

Penn., Wilkes-Barre—J. L. Johnson, Ross St.,—lathes, drill presses, electric clipping hammer and drills.

Va., Richmond—The Rennie Dairy Co., West 7th St.,—bottle washer and filler.

W. Va., Charleston—B. E. Andre, Court and Virginia St.,—18 in. 8 ft. lathes.

Mich., Detroit—The American Automobile Part Co., c/o The Thompson Starret Co., Lincoln Bldg.,—cupolas, cranes, conveyors, fans, motors, tumblers, etc.

Mich., Detroit—J. Kalbfleisch, 293 Commonwealth Ave.,—laundry equipment.

Mich., Detroit—F. J. Towar, Dime Bank Bldg.,—tools for automobile repair work.

Mich., Detroit—The Wadsworth Manufacturing Co., Jefferson Ave.,—power sewing machines.

Ohio, Canton—The Alloys Parts Manufacturing Co., 732 South Walnut St.,—disc grinder.

Ohio, Canton—The Artic Ice Machine Co., Market Ave., S.,—universal milling machine for tool room use and a universal grinding machine (used).

Ohio, Cleveland—The Crucible Steel Forge Co., 6600 Grant Ave.—lathes drill presses and grinding machines.

Ohio, Cleveland—The Eaton Axle Co., 10017 Euclid Ave., J. O. Eaton, Pres.—stamping machines.

Ohio, Cleveland—H. E. Ricker, 10607 Drexel Ave.—steam hammers, 5 to 10 ton capacity (used).

Ohio, Marion—The Power Manufacturing Co.,—84 in. boring mill.

Ohio, Toledo—The National Supply Co., St. Clair and Washington St.,—1¼ in. single head bolt cutter with quick opening die head (new).

Ohio, Toledo—The Toledo Metal Wheel Co.,—16 in. Gould & Ekerhart, double back geared crank shapers (used).

Wis., Marshfield—J. & N. Berg—wood turning machinery.

Wis., Merrill—The Borgeson Helb Manufacturing Co.,—wood working machinery.

Wis., Milwaukee—Precision Machine Co., 603 Toy Blk., 13 in. lathe, 5 ft. bed, milling machine, 20 in. drill press and bobbing machine for small gears.

Wis., Milwaukee — The Sawson Airplane Co., 522 First National Bank Bldg.,—machine shop equipment and tools.

Ia., Des Moines—Granette Products Co., 725 2nd St., concrete mixing machinery.

Kan., Coffeyville — The Mid Continent Tank Car Co.,—set of 10 ft. bending rolls and a set of 10 ft. straightening rolls or a straightening press (new or used).

Colo., Denver—The Sunshine Cleansing Products Co., 2520 Walnut St.—automatic packer, pulverizing machine, filling machine and machine to manufacture round tube, 3 in. in diameter, 4¾ in. long, for containers for its product.

Ill., East St. Louis—The St. Louis Pressed Steel Co., Merchants Exchange Bldg., plans to build a mill on 26th and Bond St. Estimated cost, $40,000.

Ill., Rockford—Tarkington Motor Co., 19th Ave., has awarded the contract for the construction of a 1 story, 100 x 500 ft. factory, on Harrison Ave. Estimated cost, $50,000.

Ind., Aetna—The Aetna Iron & Steel Co., Gary, has awarded the contract for the construction of a 1 story, 75 x 400 ft. and 225 x 600 ft. rolling mills. Estimated cost, $350,000.

Ind., Indianapolis—The W. Small Co., 31 West 11th St., manufacturer of automobiles, plans to build a 1 story, 70 x 480 ft. factory, on West Washington St. Estimated cost, $750,000.

Mich., Detroit—The American Automobile Part Co., c/o Thompson Starrett Co., Lincoln Bldg., has awarded the contract for the construction of a 1 story, 105 x 254 ft. and 1 story, 303 x 361 ft. factory, on French Rd. near Gratiot Ave. for the manufacture of springs.

Mich., Detroit—The Hupp Motor Co., Milwaukee Ave., has awarded the contract for the construction of a 1 story, 42 x 132 ft. tool room. Estimated cost, $15,000.

Mich., Detroit—The Mutual Electric & Machine Co., 232 Fort St., has awarded the contract for the construction of a 1 story, 75 x 130 ft. machine shop and office, on Porter St.

Mich., Detroit—H. Scherer & Co., Jefferson Ave., has awarded the contract for the construction of a 1 story, 50 x 165 ft. factory, for the manufacture of automobile trimmings. Estimated cost, $20,000.

Mich., Detroit—F. J. Towar, Dime Bank Bldg., has awarded the contract for the construction of a 2 story, 50 x 150 ft. garage, on Cass Ave. near Davenport St.

Mich., Detroit—The Wadsworth Manufacturing Co., Jefferson Ave., has awarded the contract for the construction of a 6 story factory on Jefferson Ave. and Connor's Creek, for finishing enclosed type auto bodies and tops. Estimated cost, $450,000.

Ohio, Bedford—Lake Erie Steel and Wire Co., Stop 13, plans to build 1 story, 50 x 180 ft. mill. Estimated cost, $50,000.

Ohio, Cincinnati—The Cincinnati Shaper Co., Elam and Garrard St., will soon award the contract for the construction of a 2 story, 90 x 236 ft. factory. Estimated cost, $75,000. Bodenstein & Surrman, 2nd National Bank Bldg., arch.

Ohio, Cincinnati—The G. Gruen Watch Co., Time Hill, will soon award the contract for the construction of a 5 story, 60 x 80 ft. factory. Estimated cost, $50,000. G. C. Burrough, Commercial Tribune Bldg., arch.

Ohio, Cincinnati—The Randall Machinery Co., Powers St., is building a 2 story, 50 x 60 ft. addition to its plant.

Ohio, Cleveland—The Briggs Manufacturing Co., East 131st St. and Taft Ave., manufacturer of automobile bodies, has awarded the contract for the construction of a 2 story, 98 x 176 ft. factory, on Taft Ave. Estimated cost, $100,000.

Ohio, Cleveland—M. Hinkel, Pres. of The Hinkel Motor Truck Corporation, 6521 Euclid Ave., plans to build a 2 story, 180 x 200 ft. garage and automobile sales station, on East 71st St. and Carnegie Ave. Estimated cost, $100,000. Whitworth & Johnson, Engineers Bldg., Cleveland, Ohio.

Ohio, Columbus—The Columbus Heating & Ventilating Co., 425 West Town St., has purchased a site near its present plant and will build a 1 and 2 story, 100 x 120 ft. factory. Estimated cost, $35,000.

Ohio, Lancaster—Martin Bros., Main St., having plans prepared by G. R. Bassett, Arch., Central National Bank Bldg., Columbus, for 2 story, 90 x 165 ft. garage. Estimated cost, $85,000.

Ohio, Sidney—The Sidney Manufacturing Co., East Ave., manufacturer of automobile bodies, plans to build a 3 story, 30 x 82 ft. factory on Clinton St. Estimated cost, $50,000. United States Structural Co., City National Bank Bldg., Dayton, arch.

Ohio, Youngstown—The Lumden Bearing Co. has awarded the contract for a foundry. Estimated cost, $25,000.

Wis., Kewaskum—The Kewaskum Aluminum Co. has awarded the contract for the construction of a 2 story, 50 x 180 ft. factory. Estimated cost, $50,000.

Wis., Milwaukee — The Harley Davidson Motor Co., 3732 Chestnut St., has awarded the contract for the construction of a 6 story, 122 x 214 ft. L shaped addition to its factory, for the manufacturer of motor cycles. Estimated cost, $300,000.

Wis., Milwaukee—The W. S. Seaman Co., 480 Virginia St., manufacturer of automobile bodies, has purchased a site and plans to build a 6 story, 100 x 400 ft. and a 50 x 70 ft. factory, on Port Washington Rd. Estimated cost, $500,000.

Wis., Saukville—The Ozaukee Heater Co., plans to build a 1 story, 36 x 100 ft. foundry. Estimated cost, $20,000.

WEST OF THE MISSISSIPPI

Colo., Mineral Hot Springs—The Mineral Hot Springs Resort Co. plans to build a 1 story, 55 x 150 ft. garage. W. H. Bawman, Central Bank Bldg., Denver, arch.

Mo., St. Louis—The Lincoln Forge & Steel Co., 3700 Sievers Lane, has awarded the contract for the construction of a 1 story, 75 x 120 ft. forge shop. Estimated cost, $10,000.

CANADA

Ont., Toronto—A. D. Gorrie & Co., Ltd., 205 Victoria St., has awarded the contract for the construction of a 4 story, 75 x 115 ft. garage. Estimated cost, $125,000.

General Manufacturing

NEW ENGLAND STATES

Conn., New Haven—I. Hershman, Minor St., will soon award the contract for the construction of a 5 story, general factory, for the manufacture of paper. Estimated cost, $300,000. J. Weinstein, 6 Church St., arch.

Conn., South Norwalk—The Danor Realty Co., c/o J. C. Schaeffler, Engr., 38 West 32nd St., New York City, will soon award the contract for the construction of a factory, for the manufacture of shoes.

Conn., Wallingford—The Wallingford Gas Light Co., 210 Center St., has awarded the contract for the construction of a 2 story, 42 x 150 ft. factory, on North Cherry St. Estimated cost, $42,000.

Mass., Medford—The American Radio and Research Corporation, Medford Hillside, will soon award the contract for the construction of a 1 and 2 story, 140 x 200 ft. factory. Estimated cost, $90,000. H. F. Bryant, 334 Washington St., Brookline, Arch.

Mass., Wakefield — Heywood Bros. & Wakefield Co., Gardner, will soon award the contract for the construction of a 3 story addition to their factory, for the manufacture of chairs. Estimated cost, $150,000. Lee & Hewett, 1123 Broadway, New York City, arch.

R. I., Central Falls—The United Mets Corporation, c/o Clark, MacMillan & Riley, arch., 101 Park Ave., New York City, has awarded the contract for the construction of a 1 story, 100 x 150 ft. mill for the manufacture of textiles.

R. I., Lonsdale—The Lonsdale Co. has awarded the contract for the construction of a 1 story, 68 x 90 ft. factory for the manufacture of textiles. Estimated cost, $20,000.

MIDDLE ATLANTIC STATES

N. J., Carlstadt, (Rutherford P. O.)—Schelty Bros., Jersey City, have purchased the factory building of the Cragin Manufacturing Co., on Broad St., here, and plan to equip same as a dyeing plant.

N. J., Harrison—The Driver-Harris Co., c/o Lockwood, Greene & Co., arch., 101 Park Ave., New York City, is having plans prepared for the construction of a 6 story, 80 x 200 ft. factory, for the manufacture of michrome products.

N. J., Hoboken—H. R. Mallinson & Co., Woolsley Ave., Long Island City, is having plans prepared by Lockwood, Greene & Co., arch., 101 Park Ave., New York City, for the construction of a factory, here, for the manufacture of silk. Estimated cost, $200,000.

N. J., Trenton—The International Gasofoam Co., 564 East State St., plans to build a factory, for the manufacture of gasofoam, a substitute of gasoline. Estimated cost, $50,000.

N. Y., Binghamton—W. R. Hollingshead Co., 148 Oak St., plans to build a 4 story chemical factory. Estimated cost, $150,000.

N. Y., Buffalo—The Daily Bread Co. is having plans prepared by L. S. Beardsley, arch., 40 West 32nd St., New York City, for the construction of a 3 story bakery. Estimated cost, $200,000.

N. Y., College Point—The J. B. Klinert Rubber Co., 725 Broadway, New York City, is having plans prepared by R. G. Cory, arch., 39 Cortlandt St., New York City, for the construction of a 4 story factory. Estimated cost, $150,000.

N. Y., Jamestown—The Jamestown Wood Finishing Co. has awarded the contract for the construction of a 1 story, 30 x 190 ft. addition to its factory on Blackstone Ave. Estimated cost, $20,000.

N. Y., Lockport—Bd. of Supervisors of Niagara Co. plans to build a stone crushing plant at old poorhouse farm site. Estimated cost, $25,000. Address J. W. Turner, Jr., 80 East Ave.

N. Y., New York (Borough of Brooklyn)—Federal Composition Paint Co., 17 Battery Place, New York City, has awarded the contract for altering its 3 story factory, at 258 41st St. Estimated cost, $60,000.

N. Y., New York (Borough of Manhattan)—The Majestic Mills Paper Co., 464 Broome St., will soon award the contract for the construction of a 6 story factory. Estimated cost, $25,000.

N. Y., New York (Borough of Queens)—Dings & Schuster, 510 West 25th St., New York City, has awarded the contract for the construction of a 2 story, 56 x 84 ft. oil factory, on 14th St. near Van Alst., Long Island City. Estimated cost, $40,000.

N. Y., Rochester—Beechnut Packing Co., 1237 Main St. E., plans to build garage, repair shop and connecting subway to plant. Estimated cost, $16,000.

Penn., Coatesville—Breuinger Bros. will soon award the contract for the erection of 2 story, 80 x 126 ft. ice cream plant. B. R. Stevens, 1737 Filbert St., Philadelphia, Arch.

Penn., Forty Fort—The Newark Silk Co., Wilkes-Barre, is having plans prepared by H. A. Maier, Arch., Coal Exchange Bldg., Wilkes-Barre, for the construction of a 2 story, 50 x 90 ft. mill on Oxford St. Estimated cost, $28,000.

Penn., Forty Fort—The Passaic Silk Co. is having plans prepared by H. A. Maier, Arch., Coal Exchange Bldg., Wilkes-Barre, for the construction of a 1 story, 137 x 137 ft. mill, on Simpson and Durkee St. Estimated cost, $38,000.

Penn., Philadelphia — The Keystone Wagon Works, 1949 North 2nd St., has awarded the contract for the construction of a 1 story, 56 x 62 ft. factory on 2nd and Morris St.

SOUTHERN STATES

Ala., Birmingham—The Montgomery Coal Washing and Manufacturing Co., 3rd Ave., is building three 1 story, 70 x 80 ft. buildings, on 40th St. and 8th Ave., N. Estimated cost, $75,000.

N. C., Statesville—The Southern Milling Co. plans to build a flour mill, 1000 barrel capacity.

Va., Richmond—The Rennie Dairy Co., West 7th St., will soon award the contract for the construction of a 2 story, 87 x 94 ft. dairy. Estimated cost, $60,000. Carneol & Johnston, 6th and Main St., arch.

W. Va., Parkersburg—The Vitrolite Co. has awarded the contract for the construction of a 1 story, 200 x 300 ft. addition to its factory. Estimated cost, $300,000.

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American Machinist

ETHAN VIALL and FRED H. COLVIN, *Editors*
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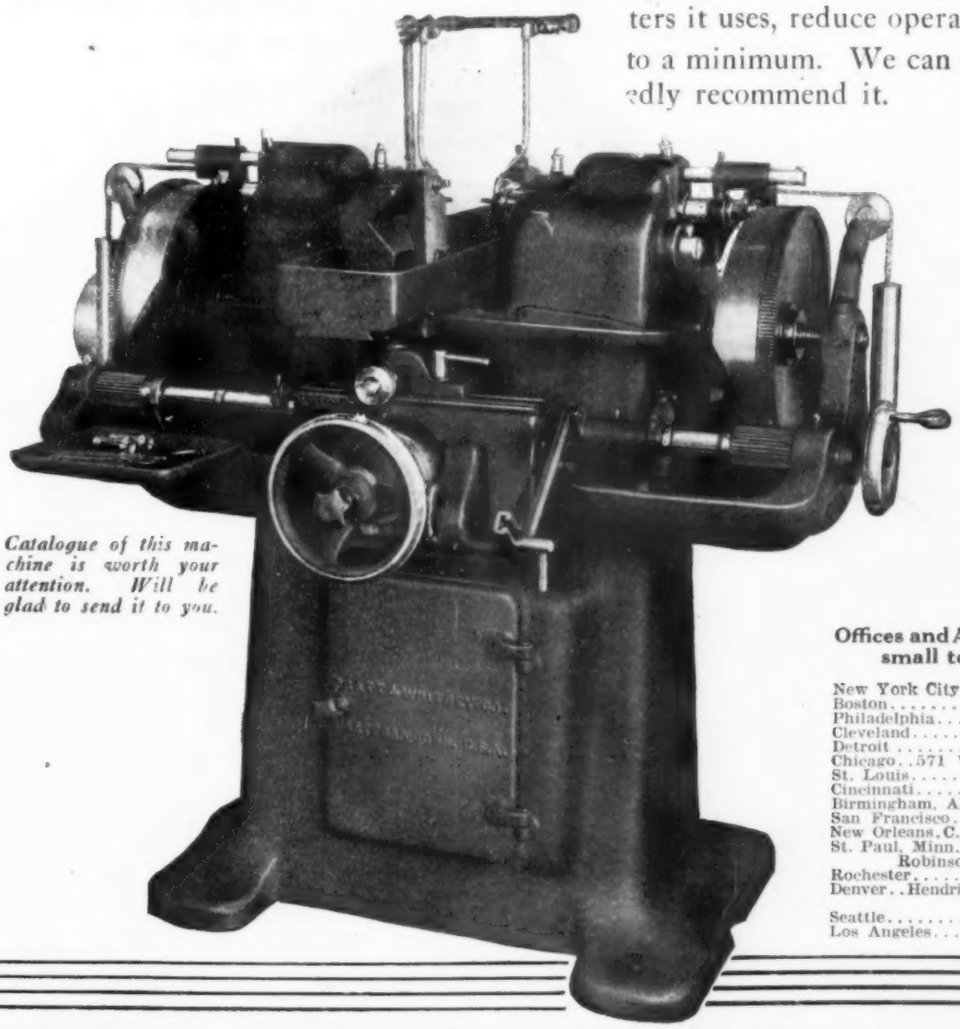

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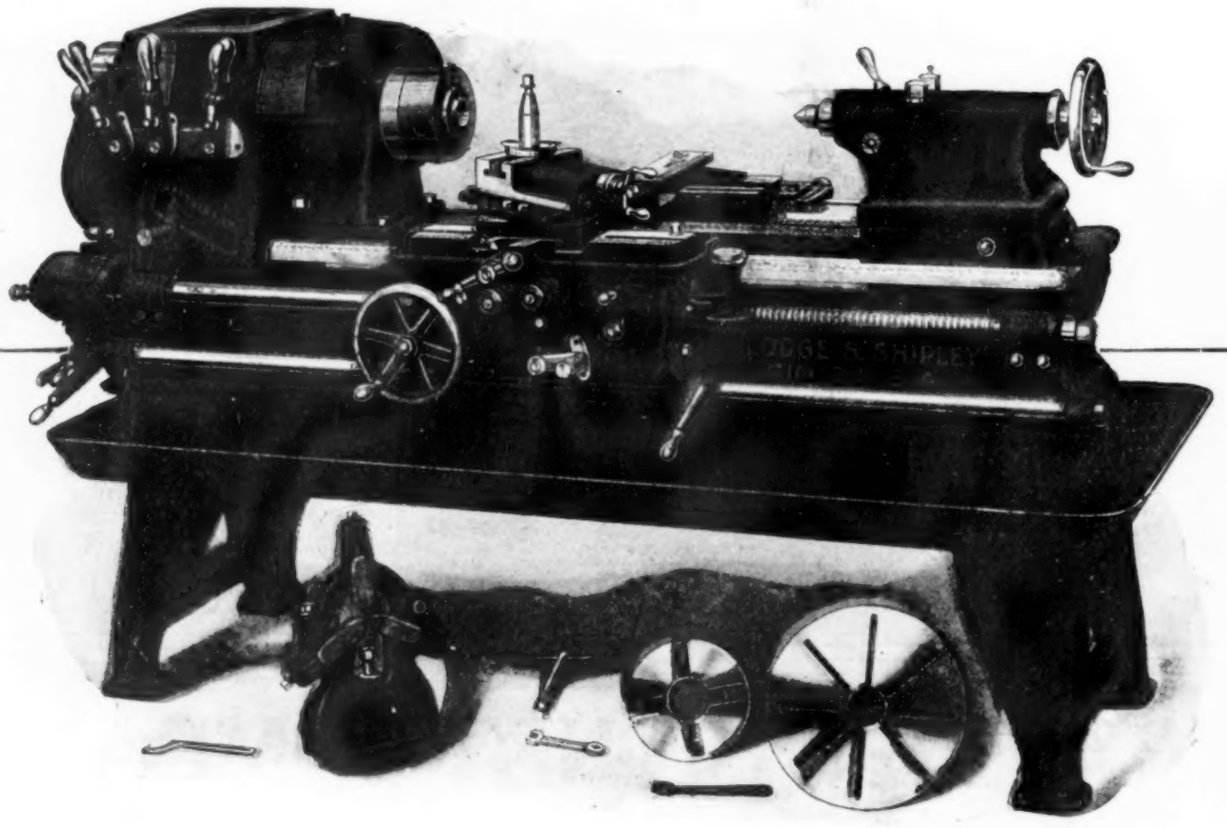
"Lodge & Shipley Tool-Room Lathes"

16-in. Set Hd. Tool-Room Lathe equipment includes Pan, Taper Attachment, Draw-in Chuck without collets.



THE LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, O., U. S. A.

Bradford Lathe Success Hints

Profit from the Experience of Others

A MAN begins to be a success the instant he realizes he does not know everything, for then he commences to learn of new things. He benefits by the experience of others and builds up a knowledge of facts that tend to shove him to the front.

The man who knows everything has no desire to study, for there is nothing under the sun that he does not understand. Too late he realizes he is a failure.

There is only one answer if you would succeed—benefit in the knowledge and experience of others.

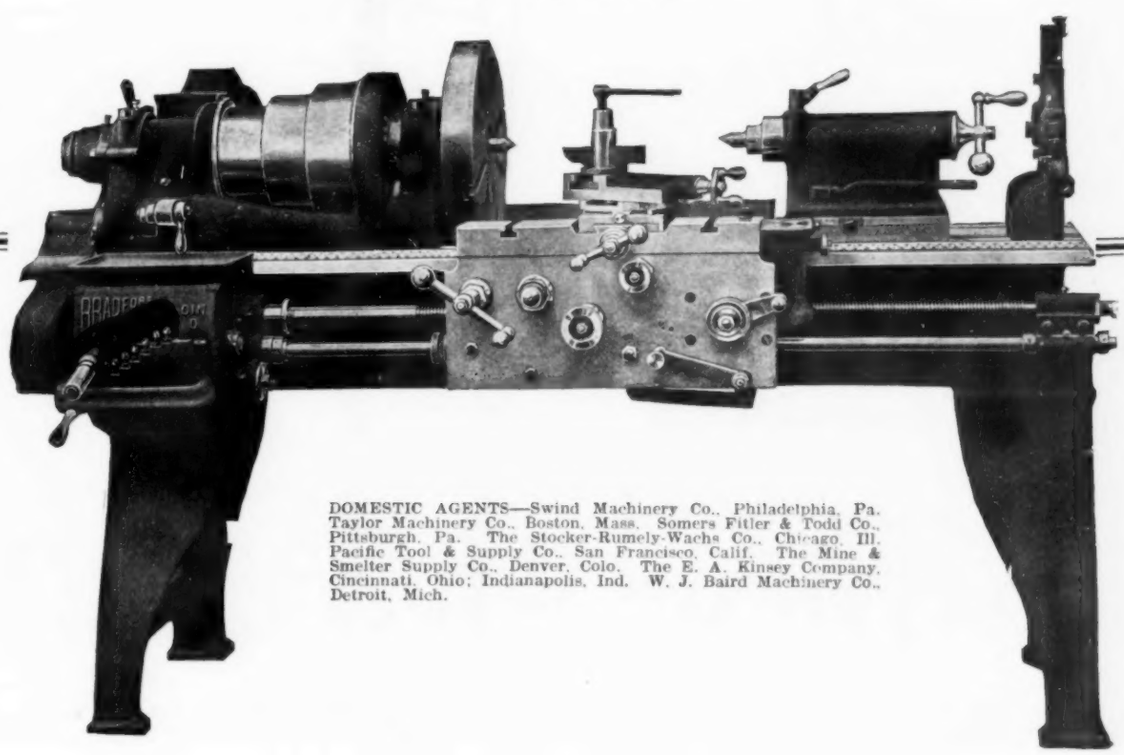
Every successful man is usually an authority in his own chosen line. He can give you good advice.

Our only line is lathes. For 35 years we have profited from our own and others' experience and we are always glad to tell what we have learned.

If you have a Lathe Problem to solve we will gladly aid you. Simply ask us.

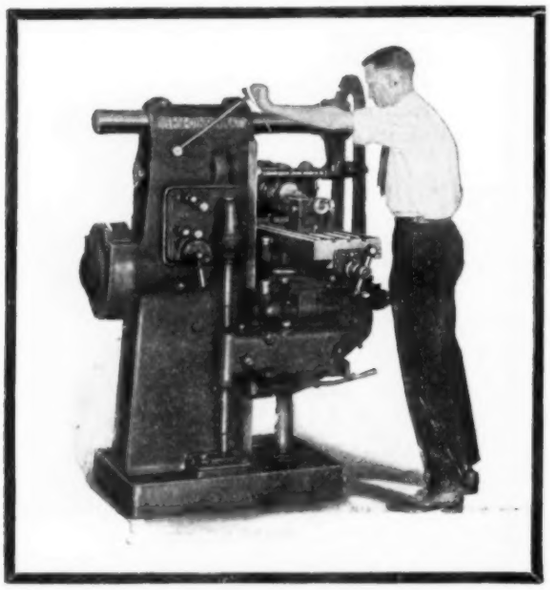
The Bradford Machine Tool Company

Cincinnati, Ohio, U. S. A.



DOMESTIC AGENTS—Swind Machinery Co., Philadelphia, Pa. Taylor Machinery Co., Boston, Mass. Somers Fitler & Todd Co., Pittsburgh, Pa. The Stocker-Rumely-Wachs Co., Chicago, Ill. Pacific Tool & Supply Co., San Francisco, Calif. The Mine & Smelter Supply Co., Denver, Colo. The E. A. Kinsey Company, Cincinnati, Ohio; Indianapolis, Ind. W. J. Baird Machinery Co., Detroit, Mich.

Without leaving his



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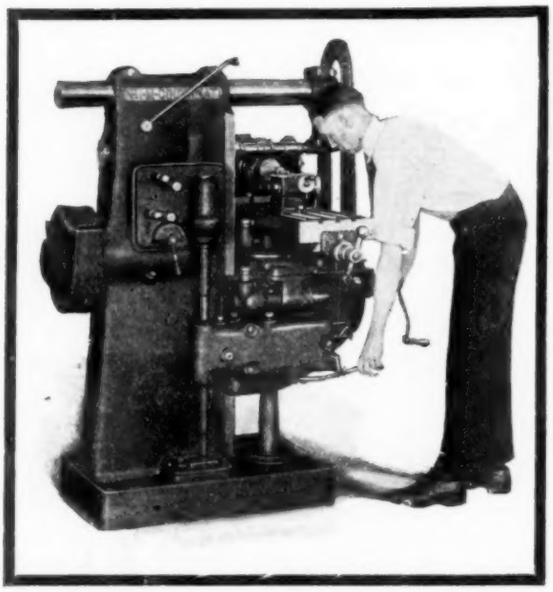


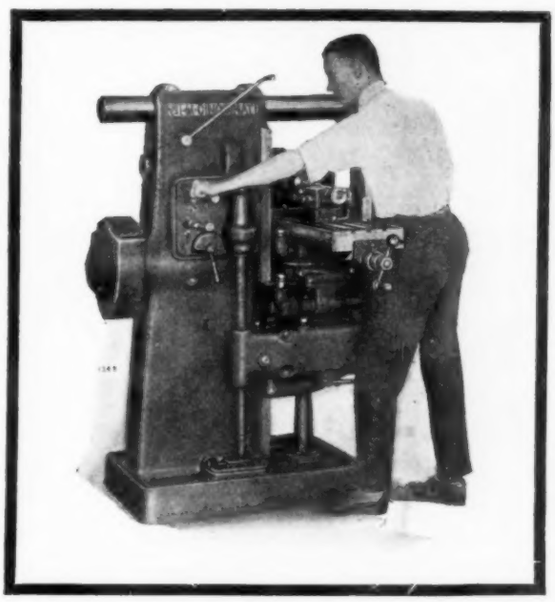
changes feeds

The
Cincinnati
Milling Machine
Company, Cincinnati, Ohio

the new 1M & 2M

position the operator

These most modern machines
will prove a revelation.
Ask for 1920 M
catalog

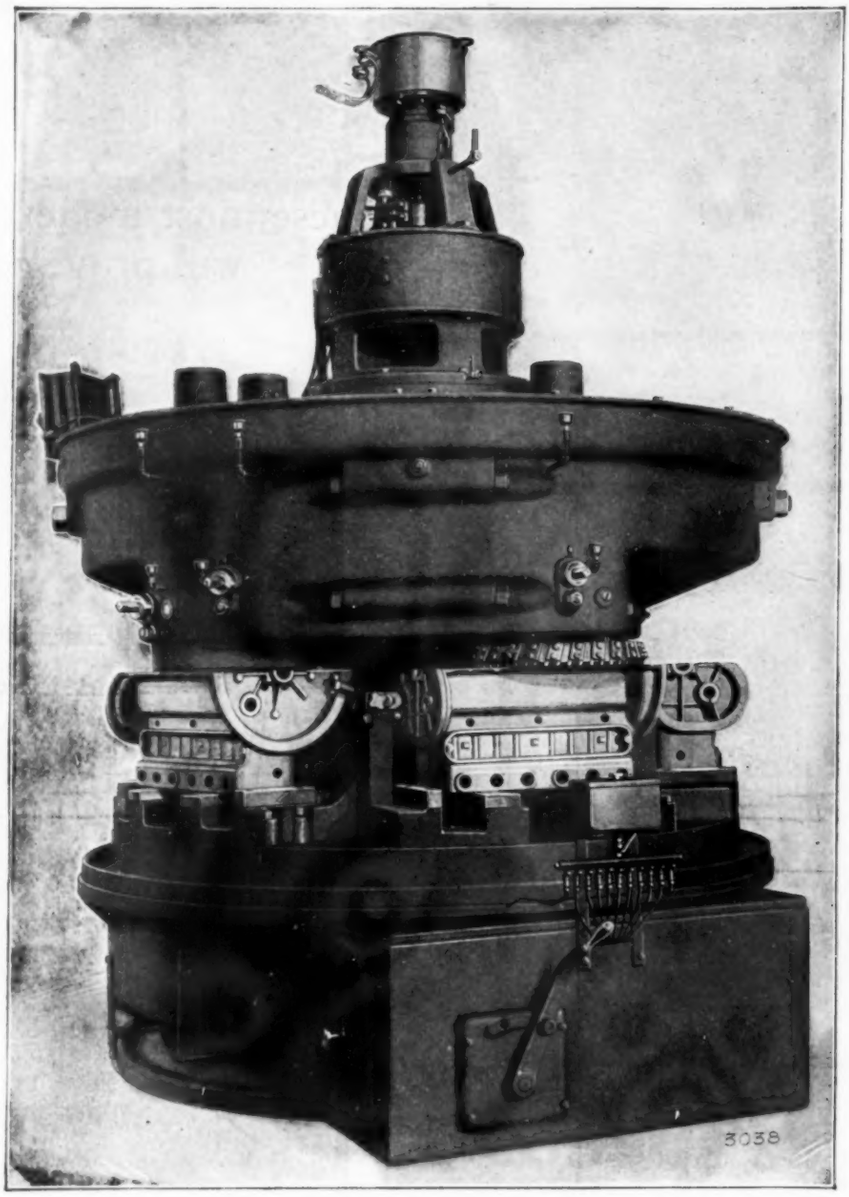


changes speeds

and stops

Cincinnati Millers

An Ingersoll Differential Type Continuous Milling Machine



A multiple spindle Continuous Milling Machine, in which every spindle is *continuously* engaged in the work and yet has only a single station where the operator unloads and reloads fixtures. The upper member carrying the spindles and the table revolve in the same direction, but at different rates of speed.

The particular machine shown in the photograph takes both roughing and finishing cuts over cylinder castings, producing over 200 in eight hours, requiring only sixty-four square feet of floor space, and a single operator.

This is the third of a series of Continuous Milling Machine advertisements.

The Ingersoll Milling Machine Company

Milling Machines and their equipment

Main Office and Works: Rockford, Illinois, U. S. A.

New York: 50 Church St. **Detroit: 1457 David Whitney Bldg.**
London: Burton, Griffiths & Co. **Paris: Fenwick Freres & Co.**

BETTS

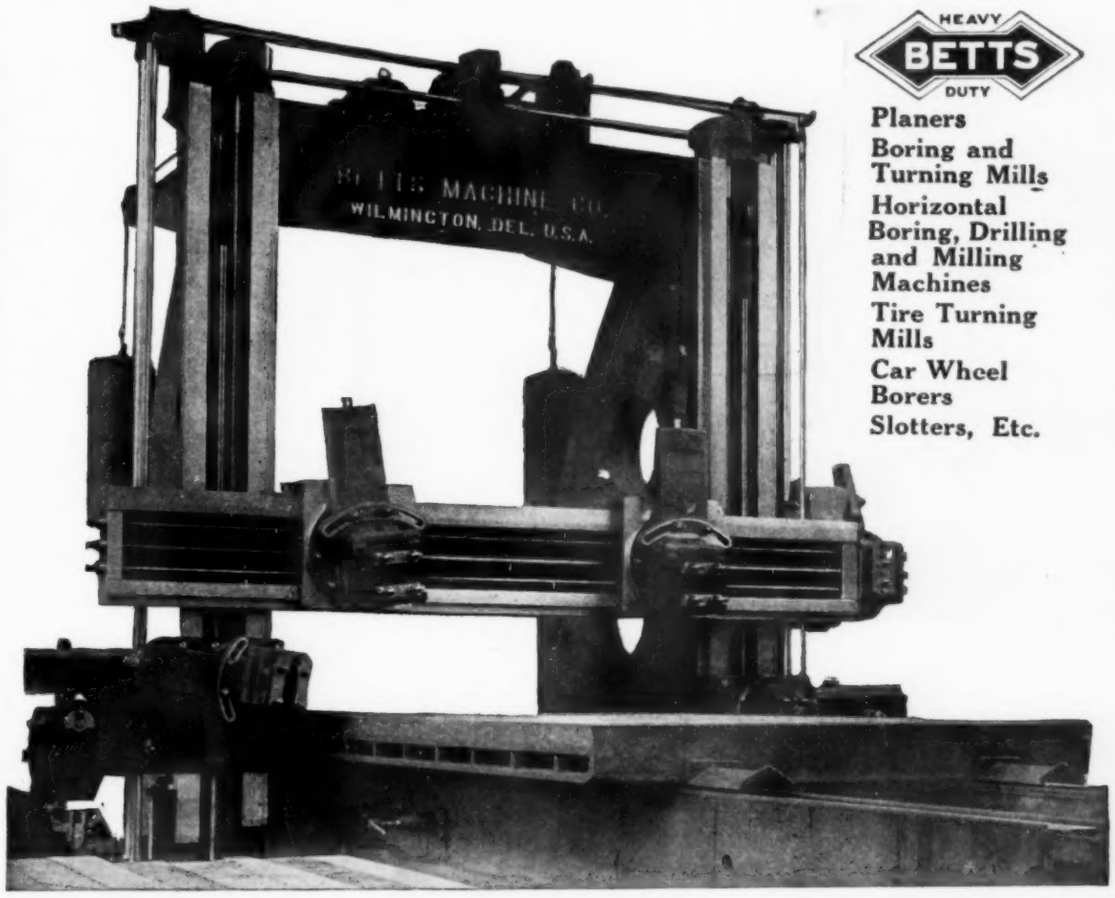
Betts Leadership in Heavy Duty Machine Tools

In every commercial field there is a leader—a trail blazer—a pace-setter.

In the heavy duty machine tool field, Betts has earned the leadership. For 58 years Betts tools have set the pace and blazed the trail to greater production and machine tool efficiency.

The number of Betts tools in operation in the world's largest locomotive works, railroad shops, steel mills, shipyards, forge shops, electrical shops, etc., is convincing evidence of Betts leadership in the heavy duty machine tool field.

Let us send detailed specifications, quotation and delivery on any Betts tool. Many Betts owners will be glad to show their machines in operation. Send for list of installations.

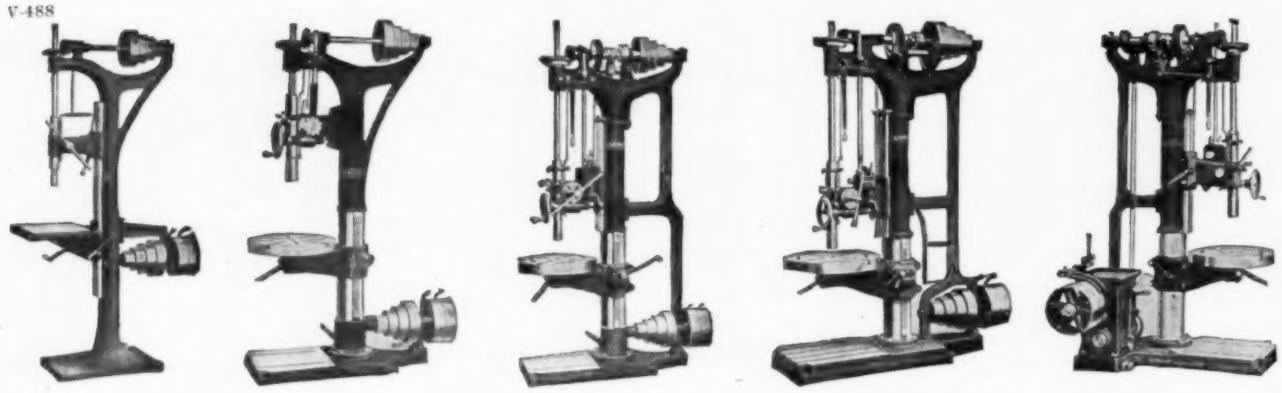


HEAVY BETTS DUTY

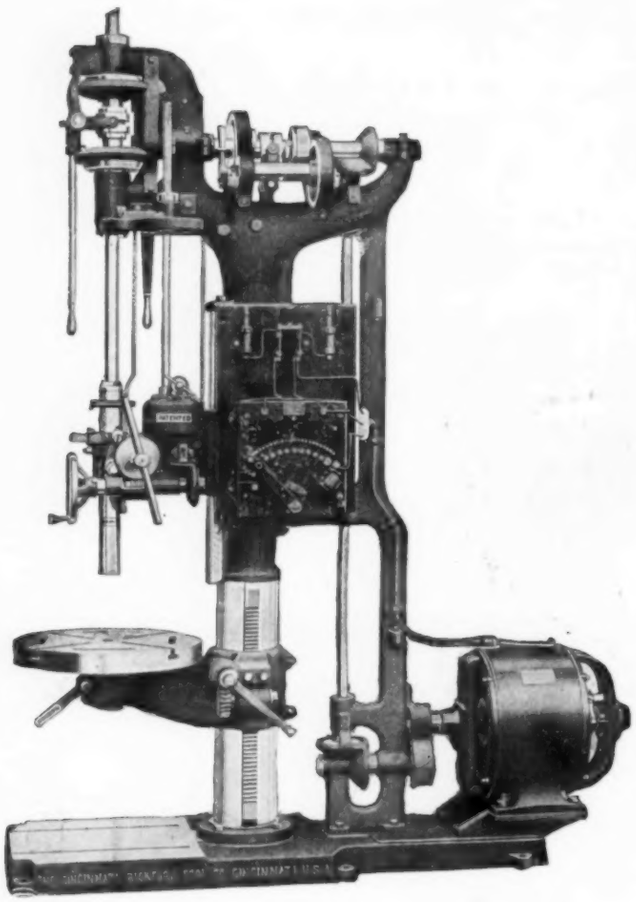
Planers
Boring and Turning Mills
Horizontal Boring, Drilling and Milling Machines
Tire Turning Mills
Car Wheel Borers
Slotters, Etc.

BETTS MACHINE CO.
402 Blossom Rd. Rochester, N.Y.
Formerly of WILMINGTON, DEL.

V-488



THE CINCINNATI BICKFORD



24-in. to 42-in. High-Speed Upright Drilling Machine

After working and studying and manufacturing a product for forty-five years, that product reaches as near to perfection as it is possible to attain.

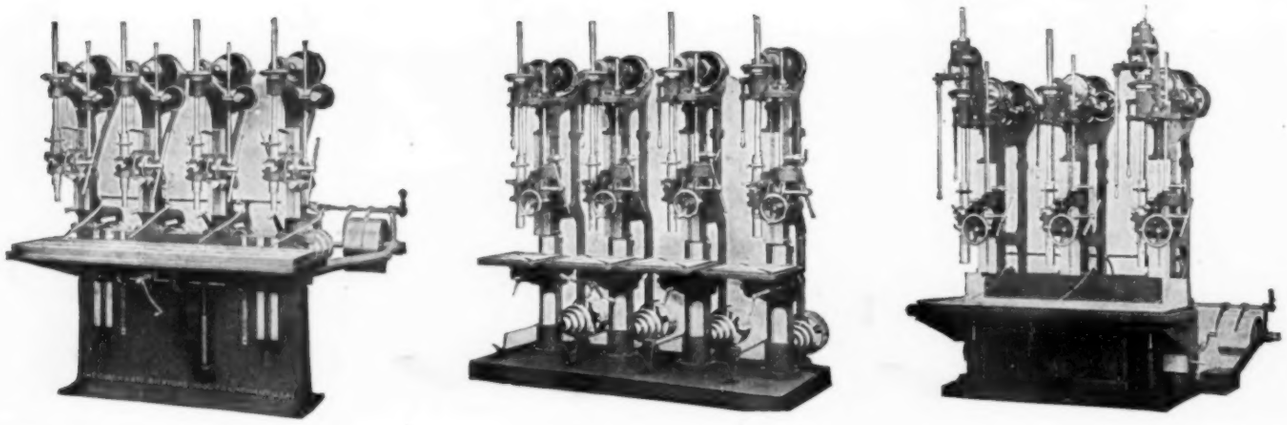
That is the case of the Cincinnati Bickford Drilling Machines. This particular type shown to the left has the following developments.

The Automatic Trip, preventing the advancing of the spindle beyond its intended range of movement. The Back Gears, operating through friction clutches, enabling speed changes while running. The Shaft Drive, simplest and most direct transmission of power.

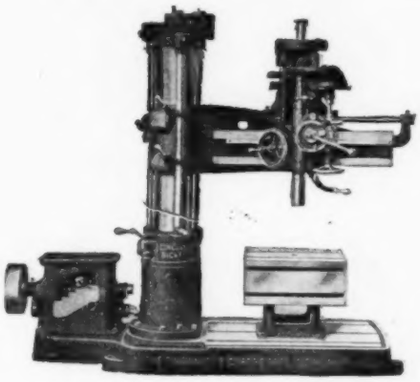
The Tapping Attachment, friction clutch operated, permitting tap to be backed out at two or more times speed used in entering it.

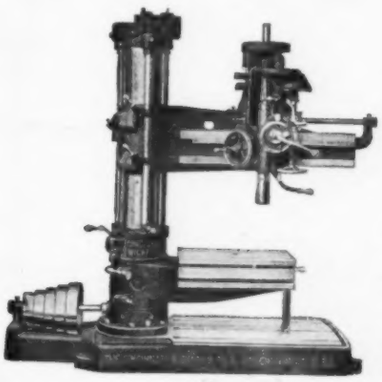
The Cincinnati Bickford Tool Co.
Oakley, Cincinnati, Ohio, U. S. A.

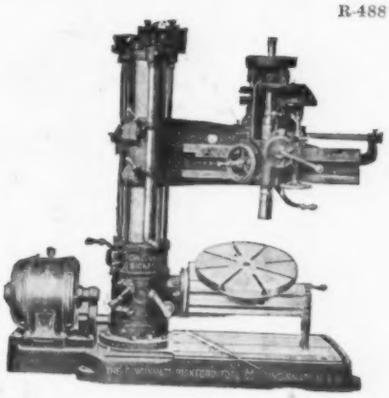
Founded 1874



R-488







THE CINCINNATI

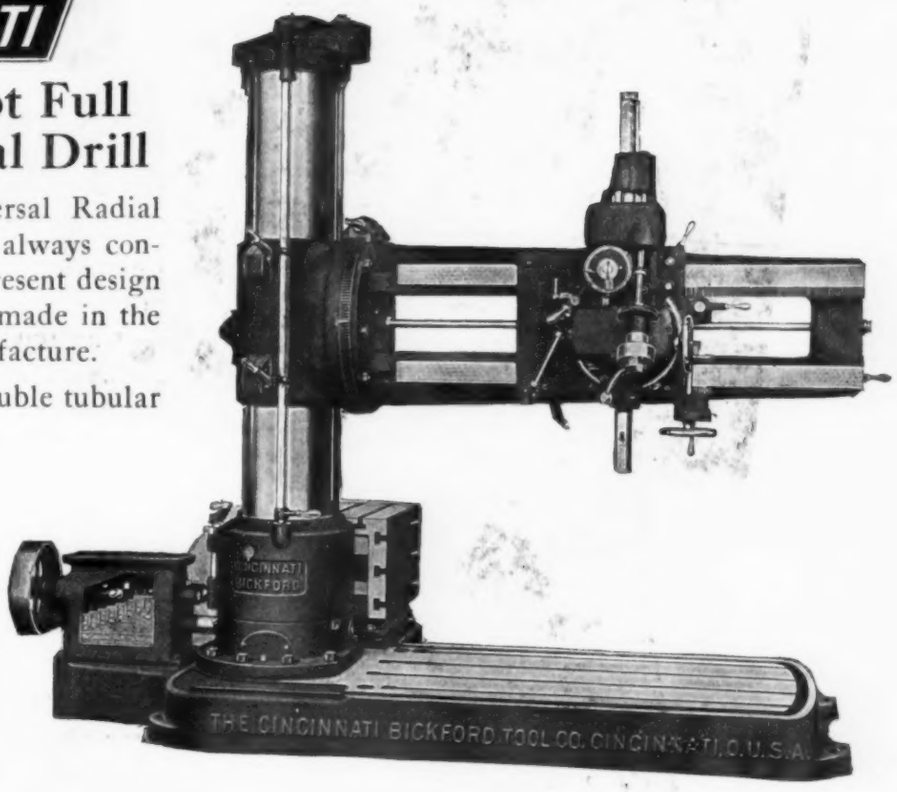
4-, 5- and 6-foot Full Universal Radial Drill

The arm of these Universal Radial Drilling Machines was not always constructed as at present. Its present design is one of the improvements made in the course of long years of manufacture.

This Patented Arm—is double tubular in construction, and doubly valuable in operation:

First—It gives the greatest possible stiffness.

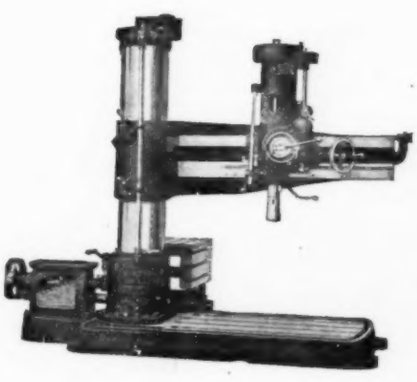
Second—It permits of proper proportioning of the back gear and reversing mechanism—not possible in an arm enclosed at the back.

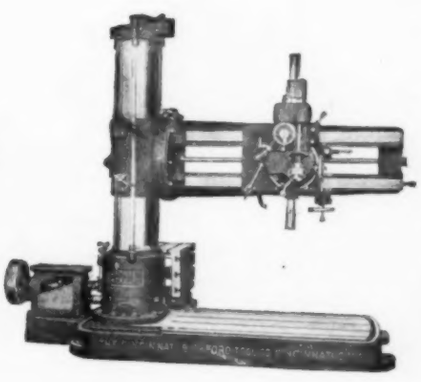


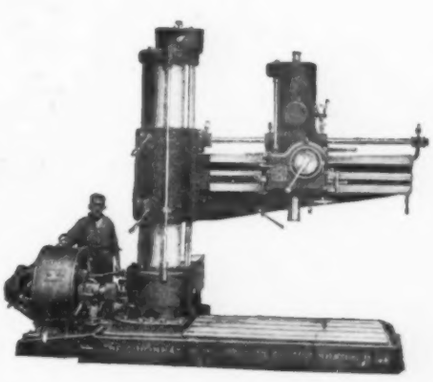
The Cincinnati Bickford Tool Co.

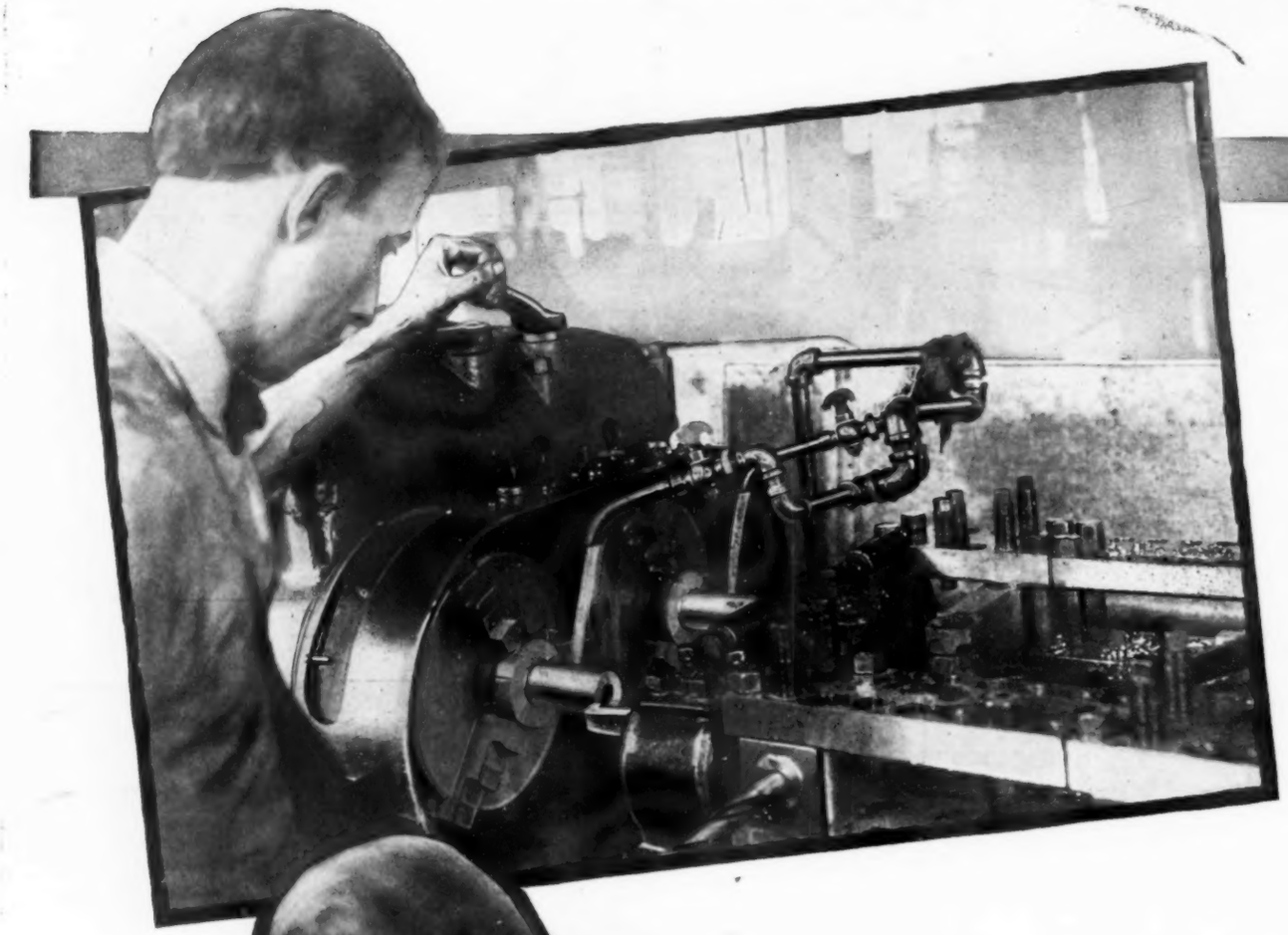
Oakley, Cincinnati, Ohio, U. S. A.

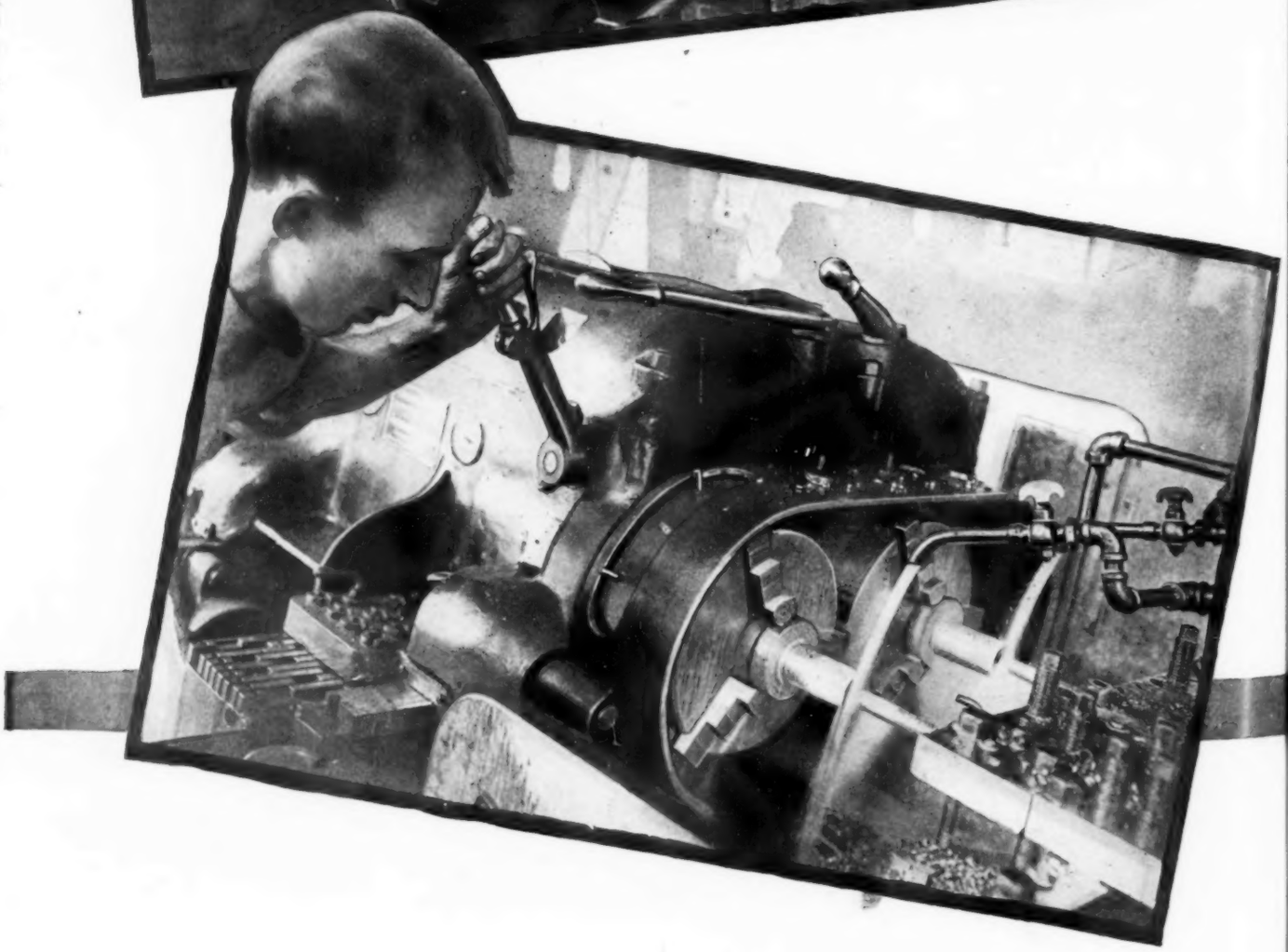
Founded 1874











Where two spindles are better than one—

Where the work comes in big lots, and the job is comparatively simple, two spindles effect a big saving in labor and time.

The Nelson Blower & Furnace Co. of South Boston, Mass., find the

Hartness Double Spindle Flat Turret Lathe—

a highly profitable machine. It employs the operator's time to the fullest possible advantage, permitting him to produce two pieces in but slightly greater time than is ordinarily required to produce one.

The Flat Turret Lathe—both one- and two-spindle—has carved a deep niche for itself among production machines. Its broad range may include your work—Ask us.

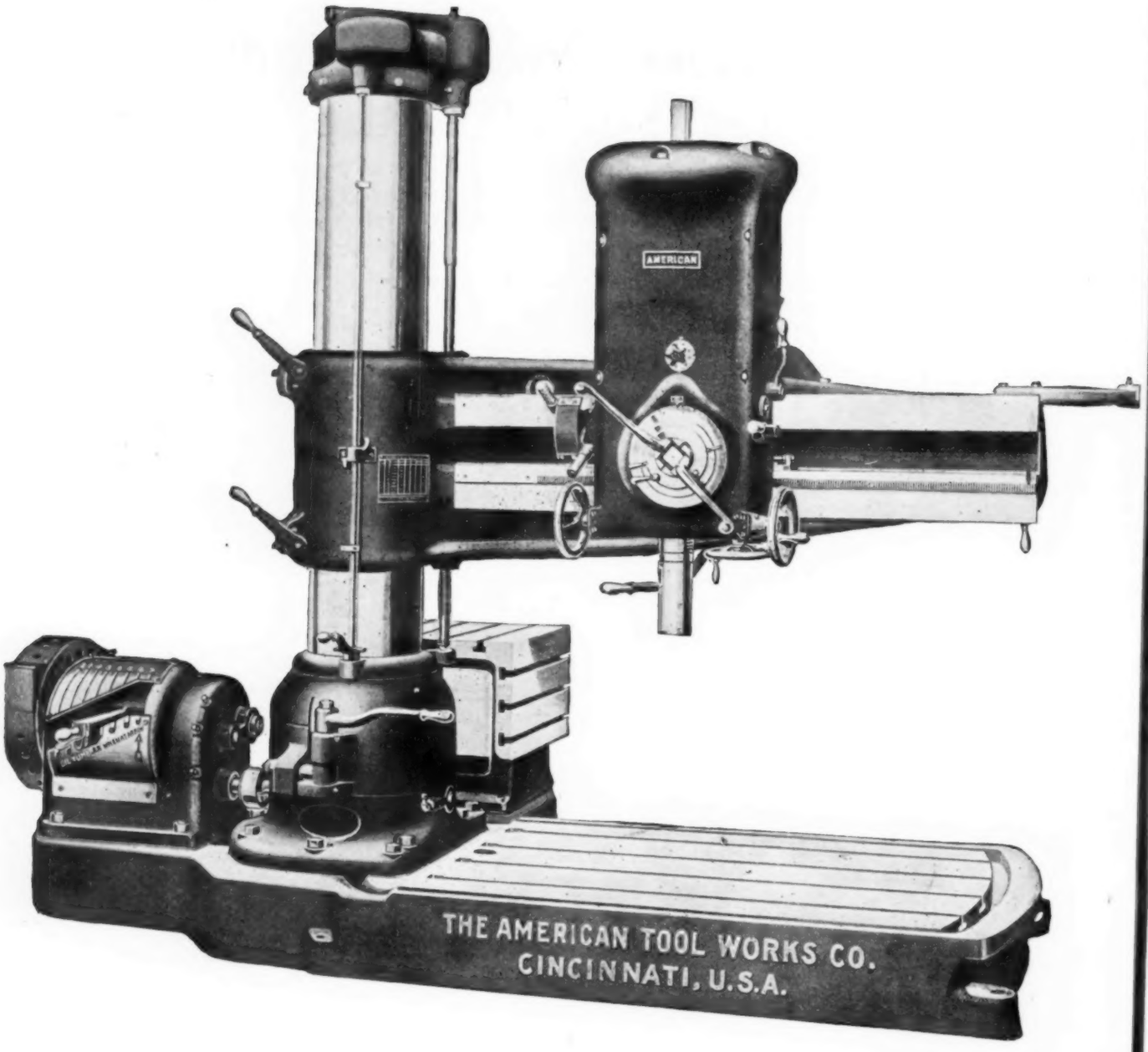
Jones & Lamson Machine Company

Springfield, Vermont, U. S. A.

503 Market Street, San Francisco, Calif. 109 Queen Victoria Street, London, E. C.
France, Spain and Belgium: F. Auberty & Co., 91 Rue de Maubeuge, Paris
Holland: Spliethoff, Beeuwkes & Co., Rotterdam Japan, Korea, etc.; Mitsui & Co., Ltd., Tokio
Australia: McPherson Pty., Ltd., 554 Collins Street, Melbourne
Sweden: A. B. Galco, Ltd., Stockholm

AMERICAN

32 Speeds



AMERICAN

Correct Speeds Mean Lower Drilling Cost

You can get much better and much longer service from your high speed drills by using the right speeds.

The wide range of speeds that you can get from an American will enable you to secure the full efficiency of your drills.

American Triple Purpose Radials provide you with 32 separate and distinct spindle speeds in geometrical progression. On the 6 ft. size the range is from 15 R.P.M. to 500 R.P.M.

The right speeds for all size drills from 3/8 in. to 3½ in. or larger, for heavy boring and for tapping up to 8 inches, are supplied.

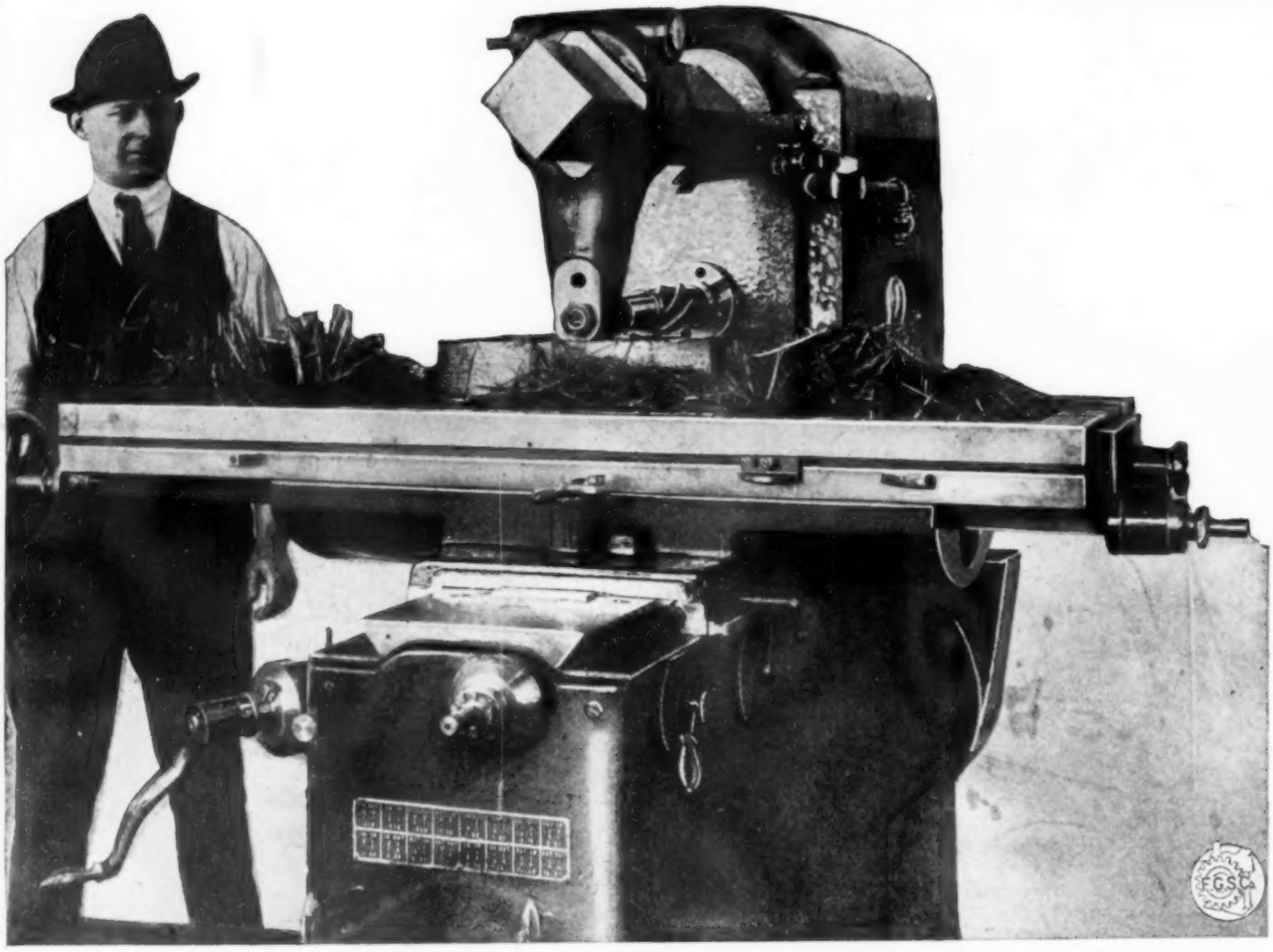
No other radial provides such a range. Get all the facts about the "American" from Bulletin 390.

The American Tool Works Company

Cincinnati, U. S. A.

Lathes Planers Shapers Radials

Here Is a Case Where Great Accuracy Was Absolutely Necessary



Cleveland Milling Machine which has Square Overarm Support

Rigidity is very necessary in any machine which must operate a cutting tool efficiently, and this is especially true on a milling machine designed for economic production.

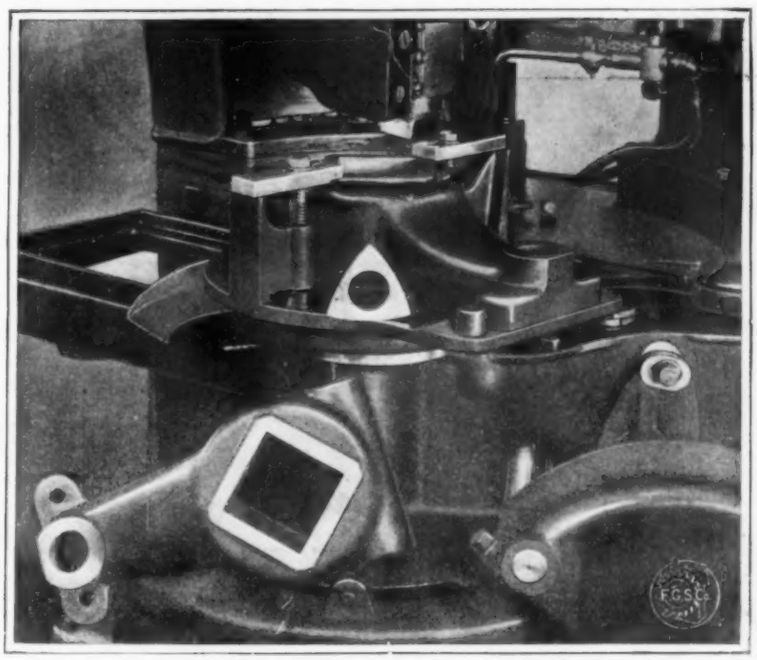
The new type of milling machine built by the Cleveland Milling Machine Company, Cleveland, Ohio, incorporates some interesting features in its design, one of which is the square overarm. This square overarm presented some difficult problems in manufacture, and especially the square hole in the overarm support.

Various methods were suggested for machining this hole, but none of them could be relied upon to give the necessary accuracy.

Consequently, the Gear Shaper was applied to this work, and the results were better than were anticipated. It was possible by means of the Gear Shaper cutter to get a "plug-gage fit" of this overarm support on the square overarm, and to also obtain absolute interchangeability.

The way in which this was accomplished is interesting and is presented in the detail view, which shows the three-cornered Gear Shaper cutter at work generating the square hole.

Tests made on the Cleveland Milling Machine, on which this square-hole principle is incorporated, have demonstrated the fact that the square overarm support provides unusual rigidity. This would not be the case were the support not closely fitted to the overarm, so that this is an excellent illustration of the adaptability of the Gear Shaper to the production of other work than gear teeth—a class of work on which it is well known to excel.



Generating Square Hole in Overarm on Fellows Gear Shaper

If you have any problems in connection with the design of your product which require difficult machining operations and that can be produced on the generating principle, you are invited to take your problems up with our Engineering Department. This service is given gratis.

The Fellows Gear Shaper Co.

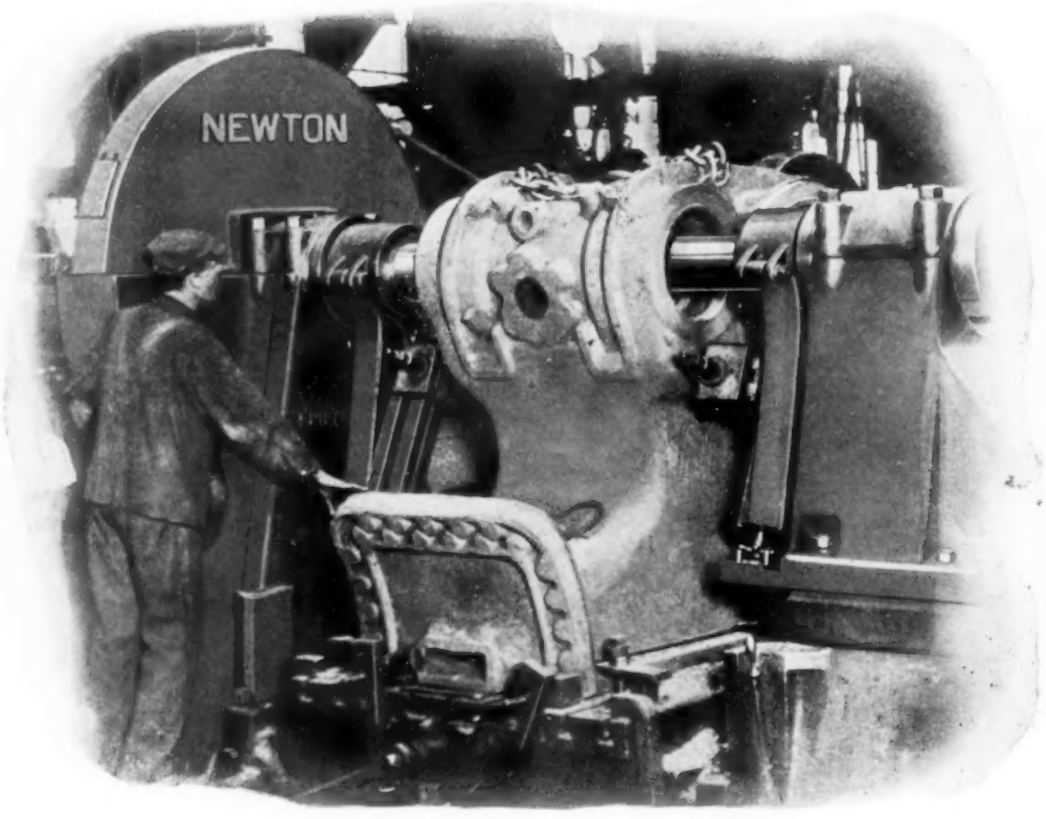
Springfield, Vermont, U. S. A.

FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, England. Societe Anonyme, Alfred Herbert, 47 Boulevard de Magenta, Paris, France. Societe Anonima Italiana, Alfred Herbert, 42 via Cajazzo, Milan, Italy. Alfred Herbert, Ltd., 14 Yamashitacho, Yokohama, Japan. Societe Anonyme, Alfred Herbert, Barcelona, Spain. Societe Anonyme Belge, Alfred Herbert, 35 Rue de Laekin, Brussels, Belgium. A. B. Galeo, Ltd., Stockholm, Sweden.

NEW

(REGISTERED

LOCOMOTIVE CYLINDER AND
FOR BORING CYLINDERS AND VALVE



This NEWTON Locomotive Cylinder and Valve Chamber Boring Machine is one of the many successful installations of our machine tools in Locomotive and Railroad Shops.

A full description of this and the following machines and their application to Railroad and Locomotive Shop work will be found in our new Catalogue 52.

MILLING MACHINES: Vertical—Horizontal—Duplex and Rail-less Type.
SLOTTING MACHINES: Crank—Gear and Rack Driven Type.
RADIUS LINK Milling and Grinding Machines.
BORING MACHINES: Duplex Locomotive Rod—Cylinder—Car Box.
SHAPING MACHINES: Locomotive Box.
PLANING MACHINES: Crank.
RAIL Drilling and Ending Machines.

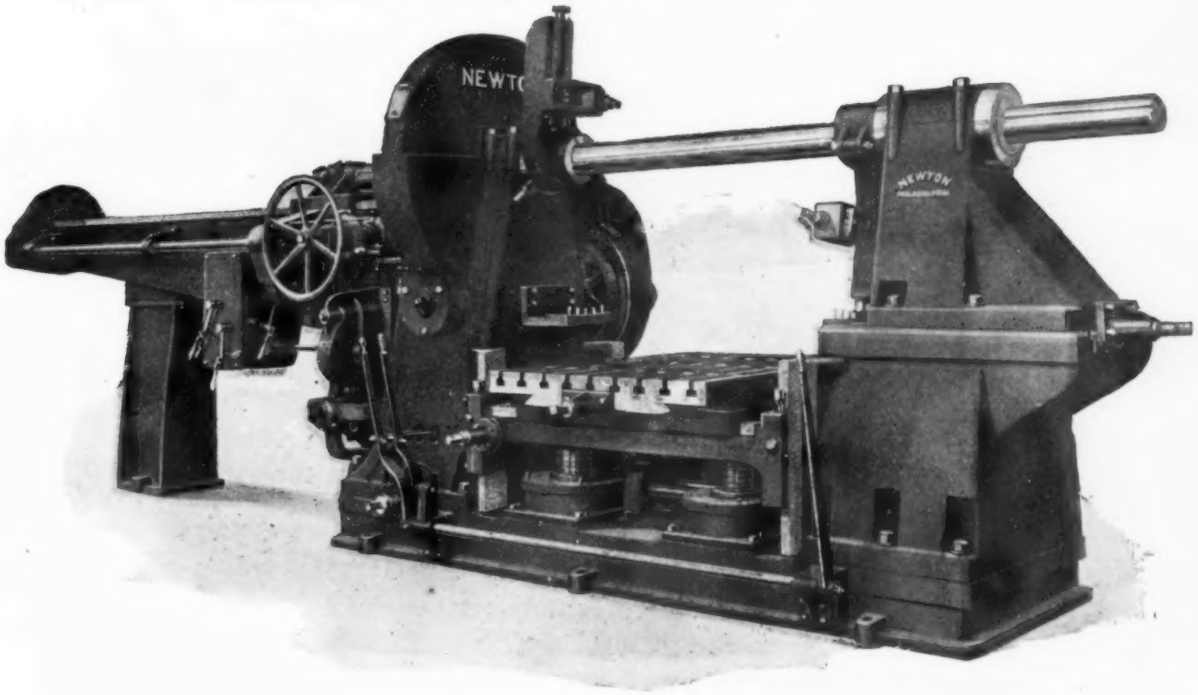
NEWTON MACHINE TOOL WORKS, Inc.,

TON

TRADE MARK)

VALVE CHAMBER BORING MACHINE

CHAMBERS AT ONE SETTING



A Valuable Machine for Railroad and Locomotive Shops

The NEWTON Cylinder and Valve Chamber Boring Machine promotes economies in the boring of cylinders having piston valve chambers, as the boring and facing can be accomplished with one setting.

The work table carrying the cylinder is adjusted vertically and across in changing from boring cylinder to boring valve chamber. To provide for different lengths of cylinders, the table and outboard support are adjustable longitudinally so that cylinder can be kept central between facing arms.

Twenty-Third and Vine Sts, Philadelphia, U.S.A.

The P&J is Producing Right Along-But

Where's the Operator?

THE operator is attending to some other P & J Automatic—taking out the finished work or putting on another piece. That's about all the P & J operator does.

In the meantime the other two or three or five P & J's are running right along—boring, turning, reaming, etc., the work. And that explains, in part, the secret of the profitable production of P & J Automatics. There is no paying for unproductive labor.

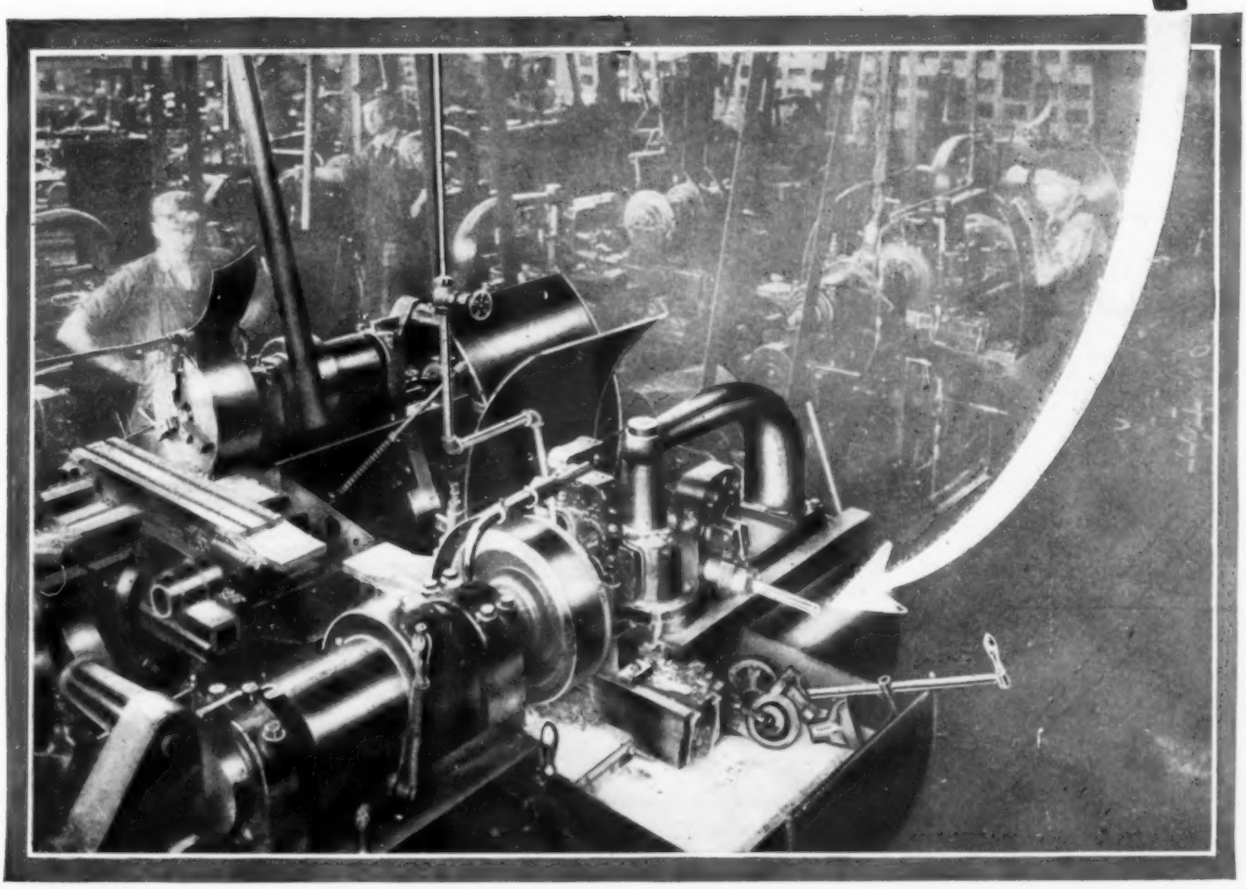
So much for the BIG IDEA in P & J Automatics.

The other advantages are a matter of practical mechanical design and sound construction. The P & J scores high on every point. Its flexibility adapts it to many varied requirements; and in the making of duplicate parts its power for profit has been the saving grace for many a manufacturer.

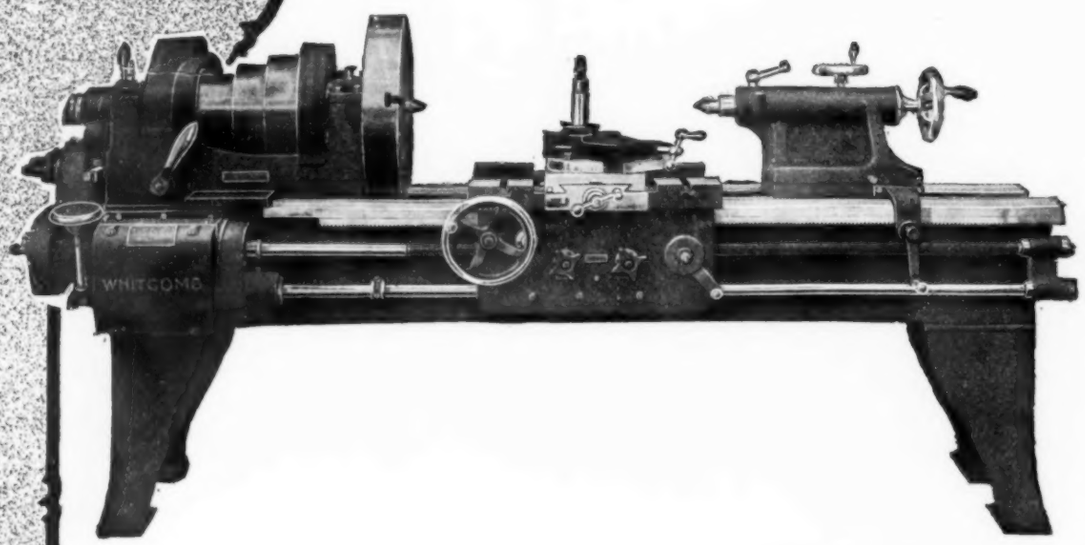
POTTER & JOHNSTON

Pawtucket, Rhode Island, U. S. A.

New York Office: Fulton Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: Modern Machinery & Engineering Co., 1514 Ford Bldg. Chicago Office: 1001 McCormick Bldg., Chas. H. Shaw, Manager. Toronto Office: 1501 Royal Bank Bldg., E. C. Roelfson, Manager. Foreign Offices and Representatives: Office for Great Britain, France, Italy, Belgium, Switzerland, Spain and Portugal, Potter & Johnston Machine Co., 68 Ave. de la Grande Armee, Paris, France, J. Ryan, Manager. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland. Ercole Vaghi, Corso Porta Nouva, 34; Milan, Italy. Rylander & Asplund, Stockholm, Sweden.



60 Years Experience



Machine Tools of

Sixty years' experience building machine tools has taught us many things, but nothing so much as the necessity for quality construction.

The entire line of W-B Lathes is noted for rugged strength and extreme accuracy. There is ample power at every speed to take the heaviest cuts. They are well-balanced, powerful tools that are speedy on heavy cuts and accurate on finish cuts.

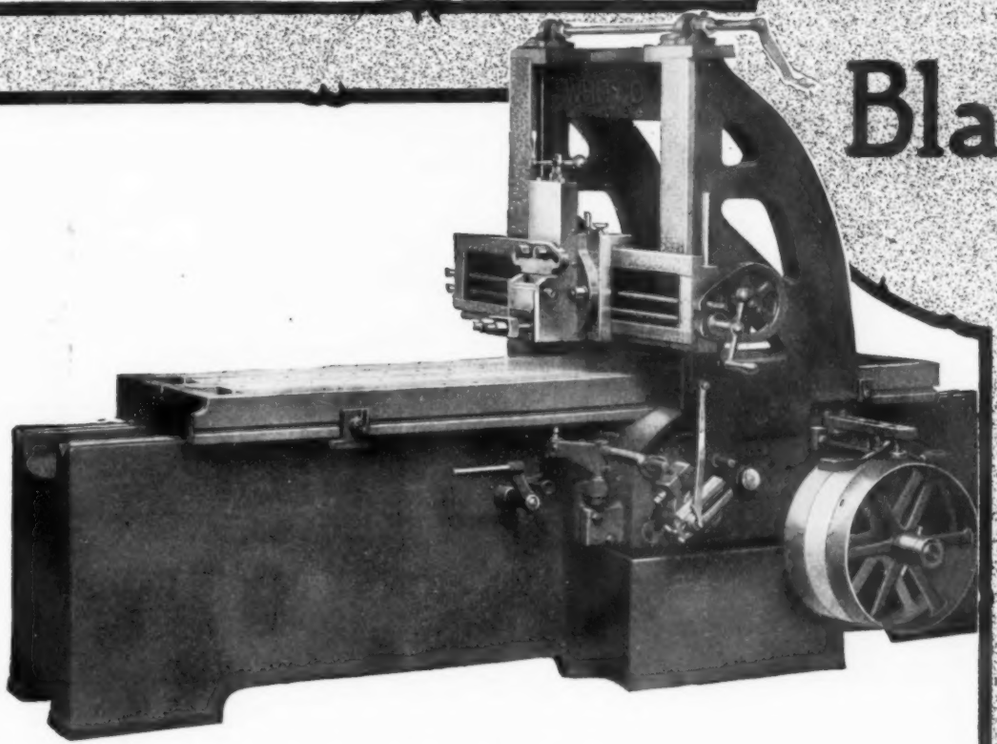
By means of the double back gears and three-step-cone pulley carrying a wide belt, nine changes of spindle speeds are obtained. Yet the effective power at each speed is far more nearly equal than in machines with single back gears and five-step-cone pulley.

Ask for a copy of our lathe catalog

WHITCOMB-BLAISDELL
WORCESTER,

Lathes 14" to 30" Swing

Whitcomb-Blaisdell



Utmost Reliability

The "cushioned" reverse of W-B Second-Belt Drive Planers enables these machines to run safely at extremely high speeds which would rack to pieces the ordinary gear-driven planer. Whitcomb-Blaisdell Planers are speeding up production in many shops by running with table speeds up to 100 ft. or more per minute.

On account of the elimination of the usual spur-geared drive, friction losses are cut down and more power is delivered to the table. Another big advantage of the Second-Belt Drive is its smoothness of action and the elimination of damaging shocks and jars. This not only assists in the turning off a smooth finely finished work, but actually prolongs the life of the planer.

The W-B Planer Catalog will interest you

MACHINE TOOL COMPANY
MASS., U. S. A.

Planers 17 "to 48" Wide

NAMCO
DIES & TAPS

Self-Opening Dies

Simple—Few parts—easy adjustments—quick change of chasers—nothing complicated to get out of order.

Strong—Solid one-piece body. Ample support of chasers. Positive releasing and setting action.

Durable—All parts that are subject to wear are hardened and ground to a precise fit.

Made in revolving and non-revolving types "for every threading requirement"

Collapsing Taps

Embody all those principles essential to the rapid and economical production of clean-cut threads, viz.:

Rigidly held chasers
Positive collapsing
Withdrawal of tap without injuring thread
Positive resetting

It's all in the construction.

Send for a copy of the new NAMCO Tap and Die Book

THE NATIONAL ACME CO.

New England Plant WINDSOR, VT. **CLEVELAND, O.** **Canadian Screw Plant MONTREAL**

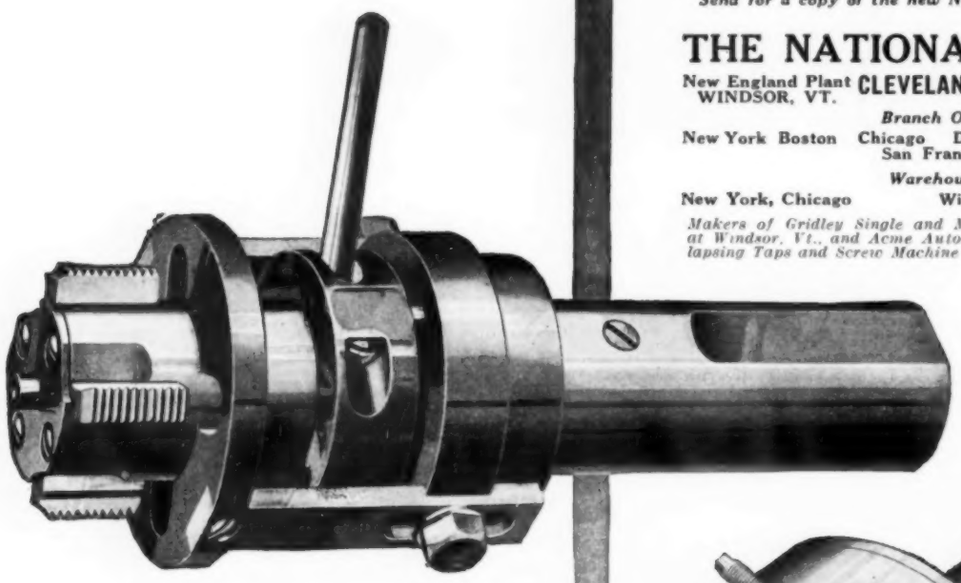
Branch Offices:

New York Boston Chicago Detroit Buffalo Atlanta San Francisco

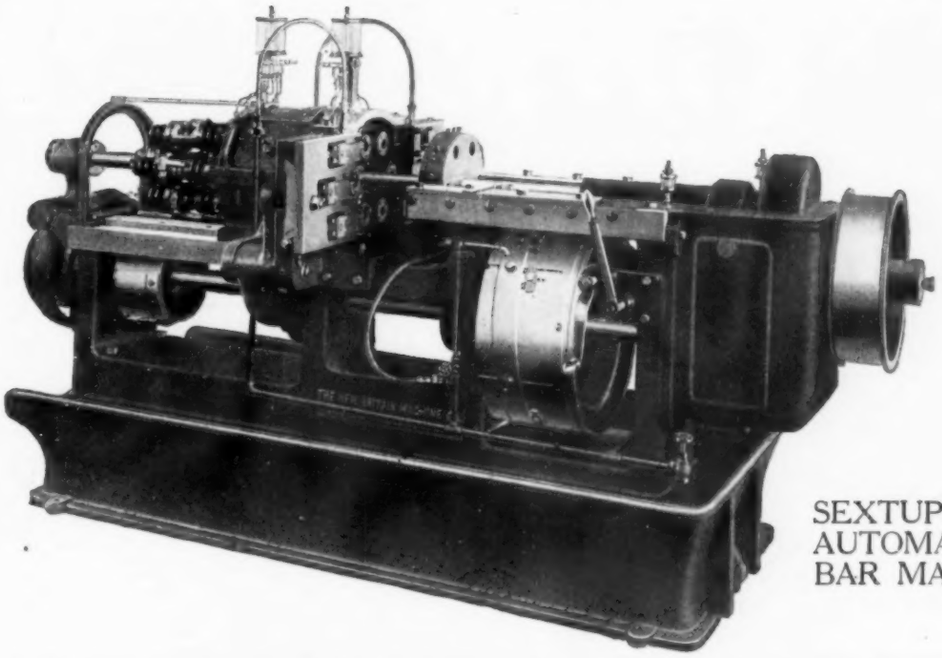
Warehouses:

New York, Chicago **With Foreign Representatives**

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vt., and Acme Automatics, Threading Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio.

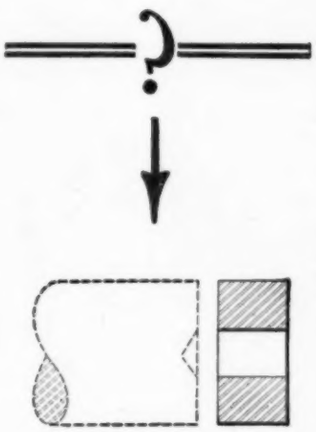


NAMCO



SEXTUPLE
AUTOMATIC
BAR MACHINE

WHY NOT
make
SIX PIECES
instead of
ONE



660 Per Hr.

INEFFICIENCY often exists where least suspected, the very simplicity of some problems robbing them of the serious consideration which their real importance justifies.

Take, for instance, the steel roll illustrated below. What shop but has one or more plain cutting-off or cutting-off-and-drilling jobs of a similar sort?

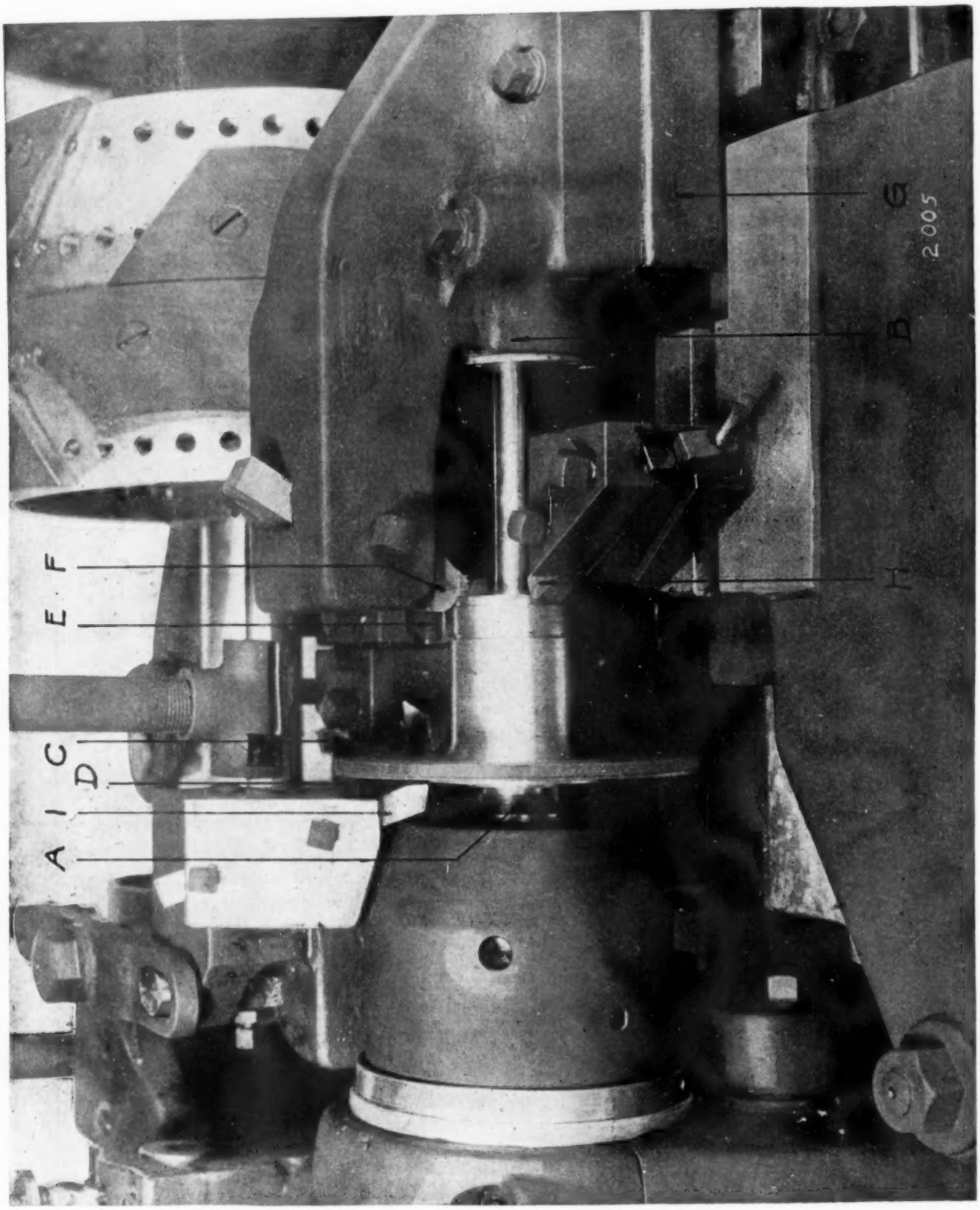
A very simple and proper task for assignment to most any single-spindle automatic, do you say? Yes—until the recent arrival of the "New Britain" Sextuple Automatic Bar Machine, designed to feed, drill, face, chamfer, and cut off in six spindle positions simultaneously and resulting in

—six fold increased productions.

Adapted for blanking studs, nuts, sleeves, pipe couplings, piston pins from tubing, etc. Capacity—1 in. round, $\frac{7}{8}$ in. hex., .707 sq., $3\frac{1}{2}$ in. feed.

For full description, illustrations of work handled, productions obtained, etc., write for Bulletin No. 955.

The New Britain Machine Company
New Britain, Conn., U.S.A.


A
C
D
E
F
B
G
H
2005

Cleveland Automatic, Model "B" Finishing Second Operation on a Ford Hub in 2½ Minutes

THE work, which is a steel drop forging, 6 in. flange diameter by 3¼ in. long is seen in the cut surrounded by the six cutting tools. It is carried on a taper arbor "A" attached to the spindle, this arbor being fitted with a key for driving the work which comes to the automatic with the hole and keyway finished at a previous operation. The arbor is supported at its outer end by a ball bearing mounted in the front end of the turning block "B".

The flange facing tools "C" and "D" ("D" not visible) and flat forming tool "E" are carried on the rear cross slide and are the first to start removing material. At the time that the forming tool "E" reaches the small diameter the feed is reduced. The roughing tool "F" carried on the milling slide "G" is at the same time turning flange where it dwells until the finishing tool "H", carried on cross slide turning attachment and following closely behind roughing tool "F", also reaches the flange radius. The tool "I" carried on a slide with longitudinal movement is at the same time finishing the diameter of a step on the flange end of hub. All of these tools are in operation together and all recede from the work together at high speed, the turning block "B" being drawn from the arbor far enough to allow space for removing the hub. The machine then stops automatically and rings a bell notifying the operator who removes the work by means of a special wrench provided, and then placing another one upon the arbor he starts the machine.

The ease with which the Cleveland Automatic may be adapted to different classes of work is demonstrated by this job, as this is a regular machine intended for bar work.

The Cleveland Automatic Machine Co.

Cleveland, Ohio, U. S. A.

Oiling:

Gray Planers

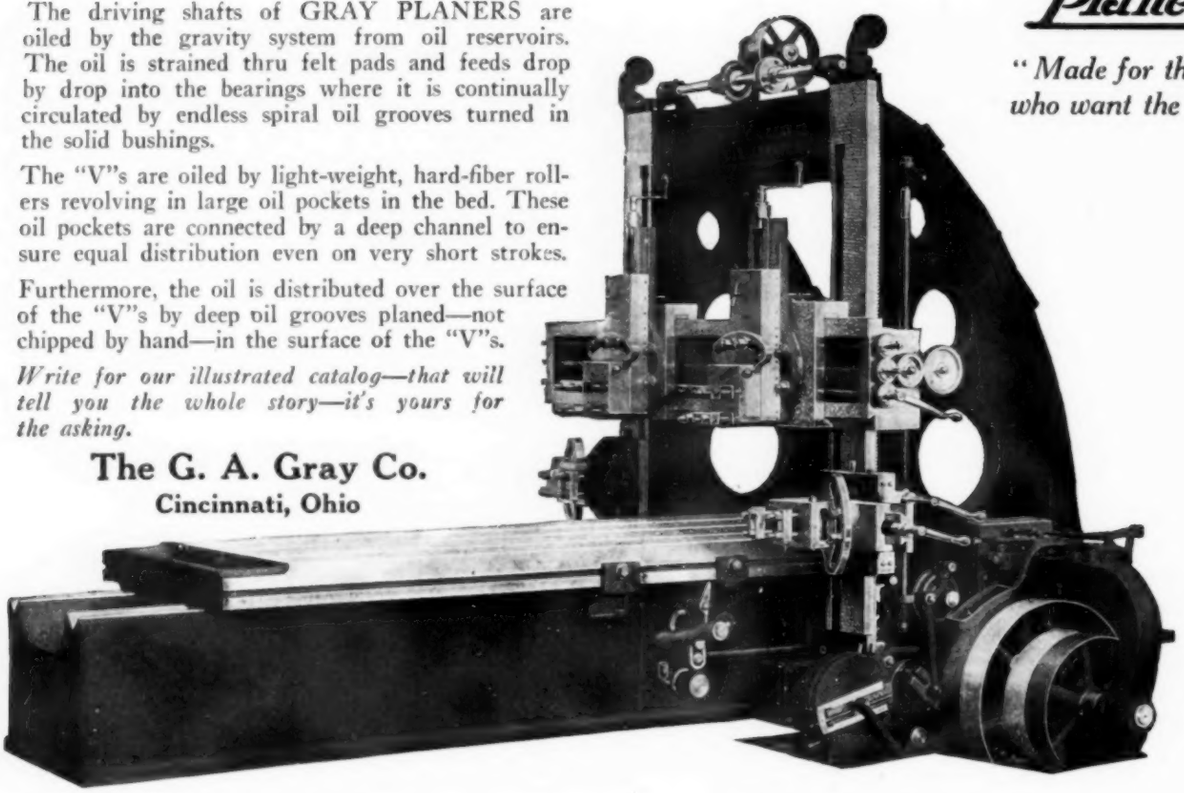
"Made for those who want the best"

The driving shafts of GRAY PLANERS are oiled by the gravity system from oil reservoirs. The oil is strained thru felt pads and feeds drop by drop into the bearings where it is continually circulated by endless spiral oil grooves turned in the solid bushings.

The "V"s are oiled by light-weight, hard-fiber rollers revolving in large oil pockets in the bed. These oil pockets are connected by a deep channel to ensure equal distribution even on very short strokes.

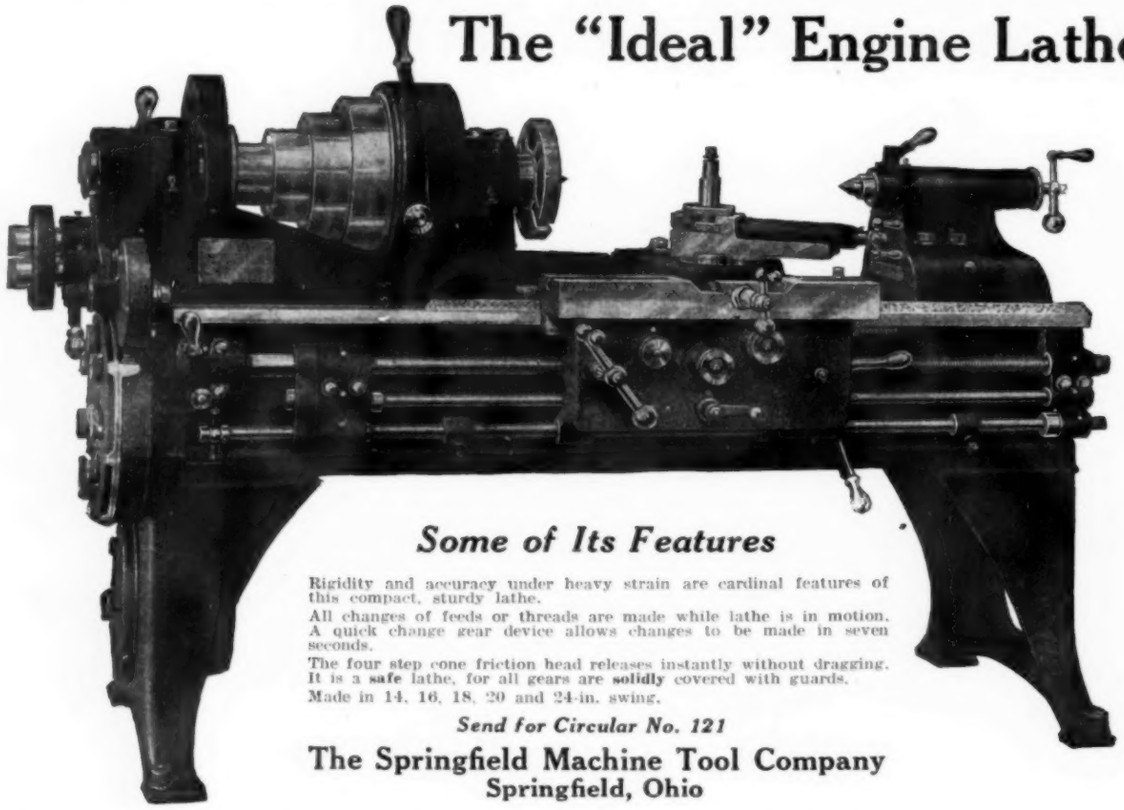
Furthermore, the oil is distributed over the surface of the "V"s by deep oil grooves planed—not chipped by hand—in the surface of the "V"s.

Write for our illustrated catalog—that will tell you the whole story—it's yours for the asking.



The G. A. Gray Co.
Cincinnati, Ohio

The "Ideal" Engine Lathe



Some of Its Features

Rigidity and accuracy under heavy strain are cardinal features of this compact, sturdy lathe.

All changes of feeds or threads are made while lathe is in motion. A quick change gear device allows changes to be made in seven seconds.

The four step cone friction head releases instantly without dragging. It is a **safe** lathe, for all gears are **solidly** covered with guards.

Made in 14, 16, 18, 20 and 24-in. swing.

Send for Circular No. 121

The Springfield Machine Tool Company
Springfield, Ohio

On Your Payroll

WHETHER poring over a blueprint, figuring a cost sheet, or mounting a ladder to inspect a line shafting, the S K F representative virtually goes on your payroll the minute he enters your plant.

So every S K F man justifies the basic S K F policy. He is a salesman only as he serves.

Not to hear bearings exploited, but to absorb the latest ideas on reducing friction—this is why the manufacturer sends for the S K F sales engineer.

And what more authentic advice is to be had than the engineering knowledge of anti-friction experts, supported by the impartial research of thorough, well equipped laboratories.

Manufacturers are invited to avail themselves of this service.

S K F INDUSTRIES, INCORPORATED
Sales, Service and Research Division
165 Broadway, New York City

504

SKF INDUSTRIES

Hess-Bright Ball Bearings
S K F Ball Bearings
Atlas Steel Balls
Gronkvist Chucks
Transmission Hangers

Goddard Tool Company

Milling Cutters

Hobs, Jigs Fixtures

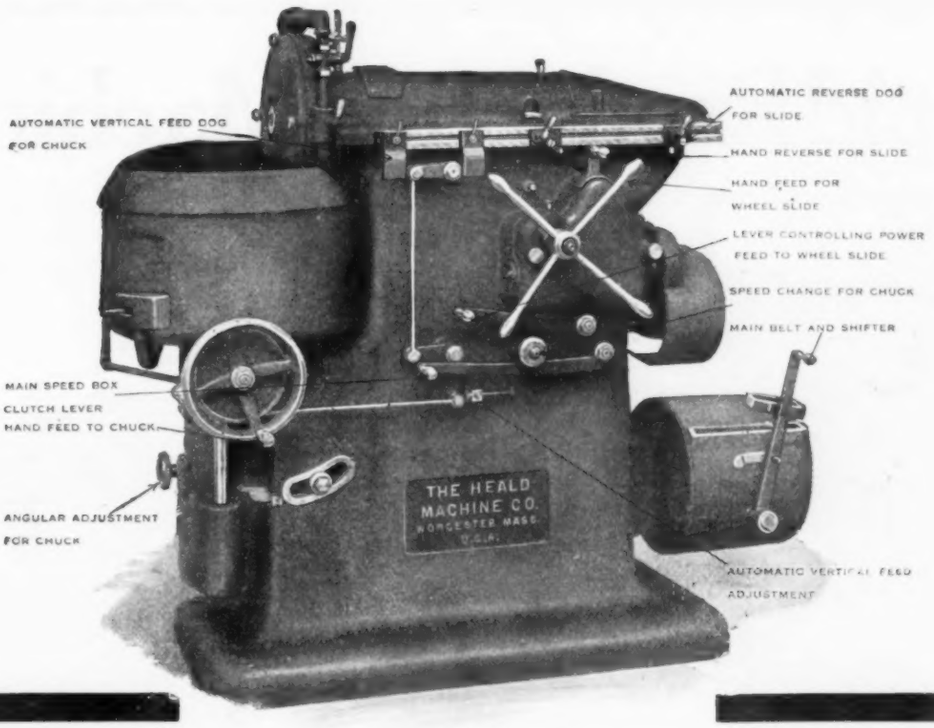
Gauges

(*Plant*) **Chicago**

BRANCH OFFICE
Bourse Bldg., Philadelphia, Pa.
Mutual Home Bldg., Dayton, Ohio

(*Plant*) **Detroit**

A stock of standard cutters and hobs is carried at both our Indianapolis and Dayton branch offices.


AUTOMATIC VERTICAL FEED DOG FOR CHUCK
AUTOMATIC REVERSE DOG FOR SLIDE
HAND REVERSE FOR SLIDE
HAND FEED FOR WHEEL SLIDE
LEVER CONTROLLING POWER FEED TO WHEEL SLIDE
SPEED CHANGE FOR CHUCK
MAIN BELT AND SHIFTER
MAIN SPEED BOX
CLUTCH LEVER
HAND FEED TO CHUCK
ANGULAR ADJUSTMENT FOR CHUCK
THE HEALD MACHINE CO. WORCESTER MASS. U.S.A.
AUTOMATIC VERTICAL FEED ADJUSTMENT

A Surface Grinder That Will Increase Production

GRIND WITH A

HEALD

AND BE SURE

The new Heald Rotary Surface Grinding Machine marks the latest step in the evolution of surface grinders. It is a rapid, rigidly built machine that will prove extremely economical and productive to the user. The Heald reputation for quality construction is lived up to in this new machine.

The wheel slide is a massive casting having a flat and "V" way insuring continued alignment. Bearing surfaces are large and well protected. Spindle belt operates with a downward pull; an important factor in rigidity.

The chrome nickel steel wheel spindle is mounted in large bearings all adjustments of which are made at grinding wheel end through an opening in top of slide.

The main drive unit receives power from the main line by tight and loose pulleys, transmitting it directly by belt to main speed box, wheel spindle and pump.

These machines are built in two sizes, with 8 in. and 12 in. magnetic chuck.

Write us or our nearest office for complete information

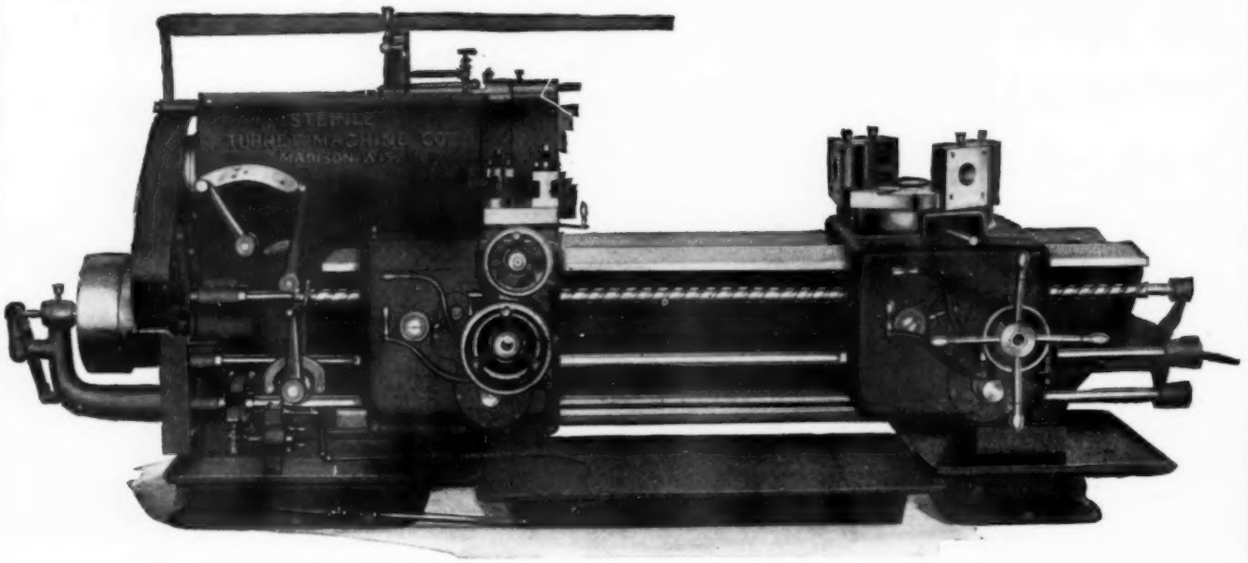
THE HEALD MACHINE CO.

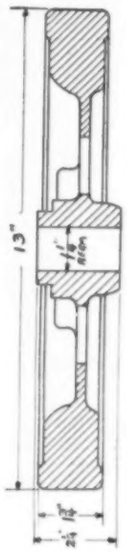
Worcester, Mass.

BRANCH OFFICES: New York, 839 Singer Bldg.; Philadelphia, 1308 Commonwealth Bldg.; Chicago, 26 South Jefferson St.; Detroit, 401 Marquette Bldg.; Cincinnati, 311 Provident Bank Bldg.; Cleveland, 721 Engineers Bldg. Western Agents: Eccles & Smith Co., Los Angeles, San Francisco and Portland; Salt Lake Hardware Co., Utah and Idaho.

FOREIGN AGENTS: Alfred Herbert, Ltd., England; Societe Anonyme, Alfred Herbert, France, Switzerland; Societa Anonima Italiana, Alfred Herbert, Italy; F. W. Horne Co., Japan; Wilh. Sonnesson & Co., Sweden, Denmark and Norway; Henri Benedictus, Brussels, Belgium; American Machinery Syndicate, Spain and Portugal.

Rapid Production Machines





STEINLE FULL SWING SIDE CARRIAGE TURRET LATHE—THE MACHINE

GAS ENGINE FLY WHEEL—THE WORK

Finished as noted floor to floor time—4½ minutes each.

Just another record of rapid production on a machine designed and built for fast, severe service in producing accurate work economically. The flywheel shown above is rough and finish bored, rough and finish turned and faced on both sides of the rim.

And this record is maintained not on one or two pieces, but on lots of several hundred—just steady, consistent production under average shop conditions.

Do your records compare with this?

Why not send us your prints of similar work and get our recommendations on production and tooling?

Steinle Turret Machine Company

Madison, Wis., U. S. A.

ORIGINATORS OF THE FULL SWING SIDE CARRIAGE TURRET LATHE

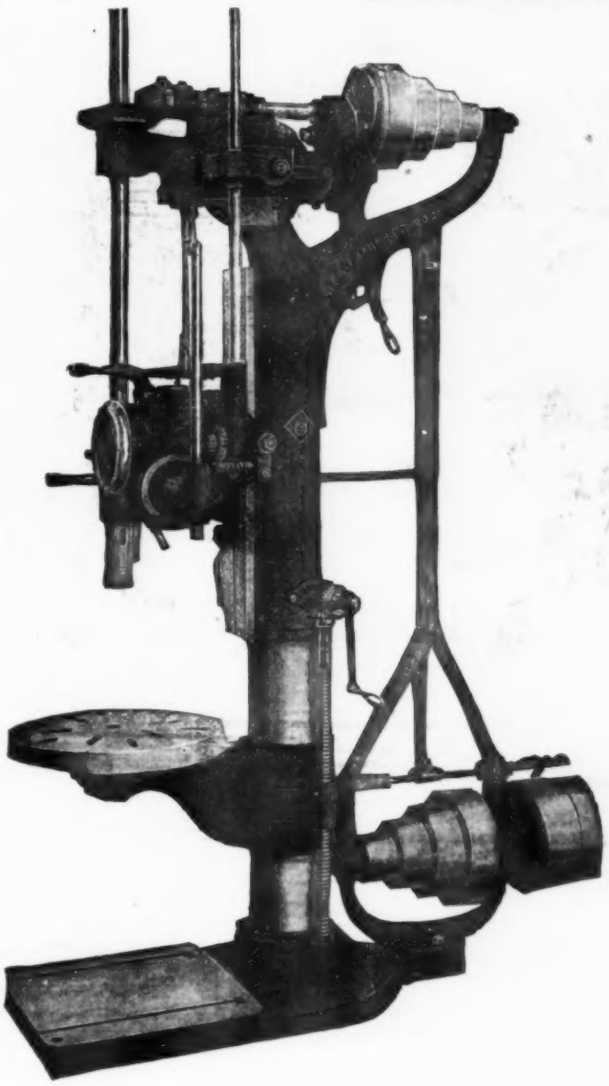
AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.

TRADE W.F. AND J.B. MARK

Complete Line

8-inch to 50-inch swing
(with or without Tapping Attachment)

Upright Drills
Horizontal Drills
Gang Drills



BARNES DRILLS

Accuracy—Convenience of Operation—Strength

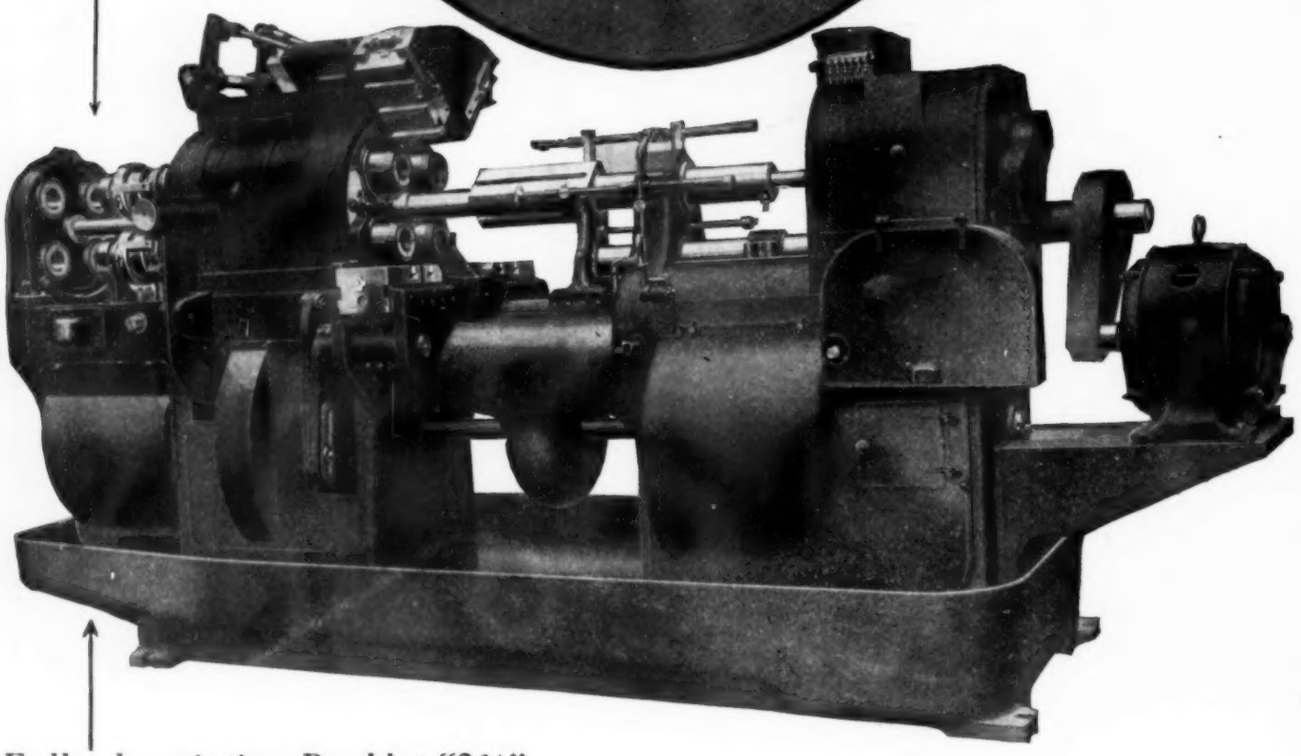
Made by

W. F. & John Barnes Co.

1995 Ruby Street **Rockford, Ill., U. S. A.**

Ask for particulars on the

$3\frac{3}{4}$"
ACME
MULTIPLE SPINDLE
AUTOMATIC



Fully descriptive Booklet "3¾"
promptly on request

THE NATIONAL ACME COMPANY

NEW ENGLAND PLANT
WINDSOR, VERMONT

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QUEBEC
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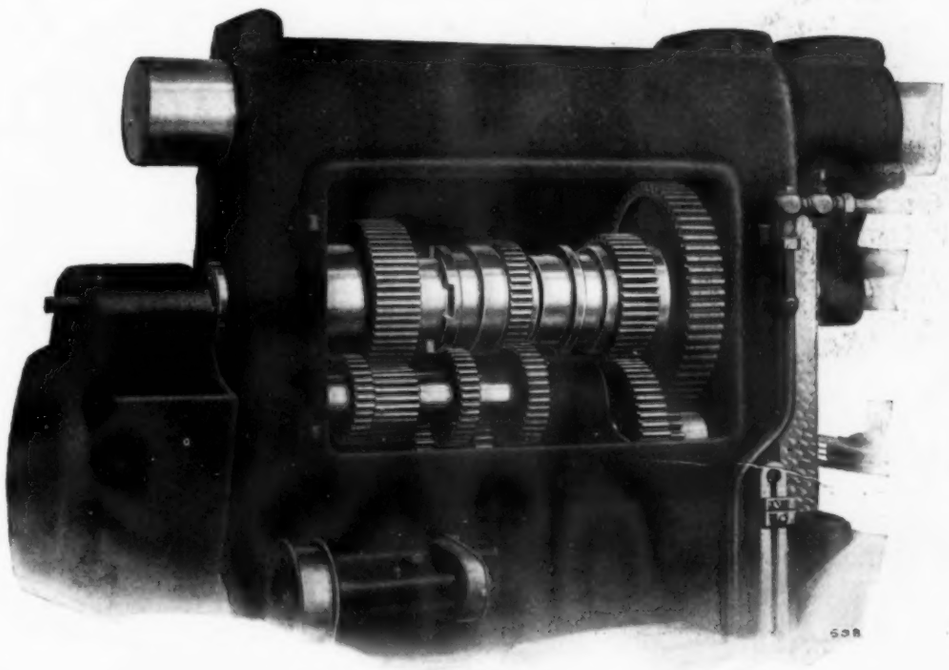
BRANCH OFFICES:
NEW YORK, BOSTON, CHICAGO, DETROIT, BUFFALO, ATLANTA, SAN FRANCISCO
WAREHOUSES—NEW YORK, CHICAGO FOREIGN REPRESENTATIVES

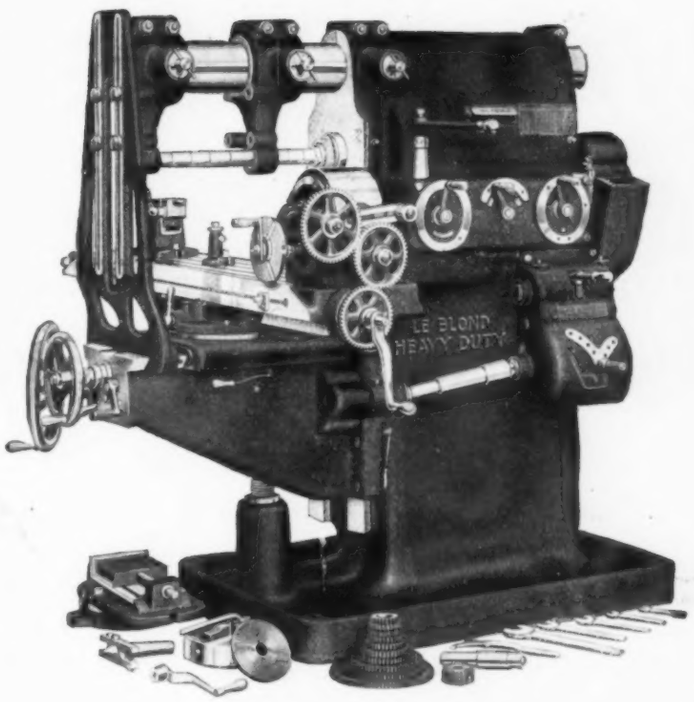
Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio

Consider the Large Face Gear on the Le Blond Heavy Duty Milling Machine



THE FACE GEAR IS AS LARGE AS THE LARGEST CUTTER THE MACHINE WILL SWING. All speeds must come through the large face gear, as it is the only member keyed to the spindle.

The Sliding Gears, Clutches and Mating Gears are of chrome nickel steel heat treated and hardened, with special stub tooth forms for increased strength. The gear layout is identical with a selective speed automobile transmission, no tumbler gears, ratchets, frictions, chains or other uncertain devices. DIRECT INDIVIDUAL oil tubes lead from a central oil well to each journal. This is a certain and definite means of supplying clean oil, in quantity, to each bearing.



The R. K. Le Blond Machine Tool Co.

Cincinnati, Ohio

Ships! Ships! More Ships!

—and Landis Helped

It was the demand not long past and it meant producing at breakneck speed—it meant the installation of machinery that would "stand the gaff" of unusual demands.

The American International Shipbuilding Corp., with a vast plant at Hog Island, Pa., installed 13 Landis Pipe Threading and Cutting Machines and a quantity of Landis Die Heads because investigation showed them that these tools could be absolutely depended upon to deliver the goods.

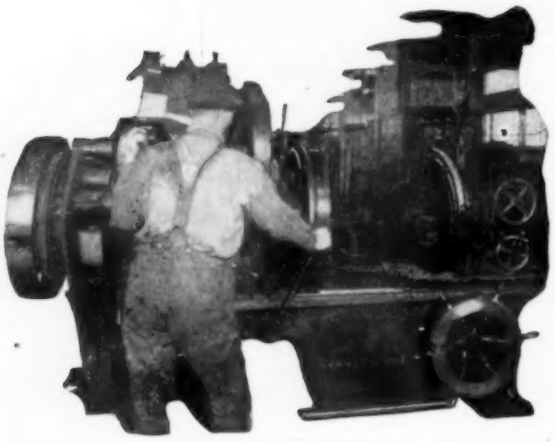
They knew, before they made the installations, that Landis chasers outlived any other by 20 times; they realized the advantage of the Landis Variable Rake Angle which permits of grinding suitable to the material being threaded.

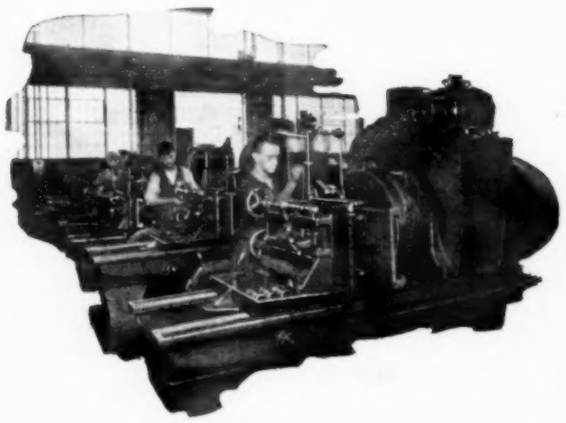
They liked the idea of having the entire range of each die head covered by one set of chasers so that the only operation necessary when changing from one diameter to another was to open or close the die head to the desired diameter. They knew also that the permanent throat of the Landis chaser permitted of close nipple threading throughout its entire life.

Do you know about these and the many other features in the Landis machine? If not, get in touch with us at once for an investigation is truly worth your while.

Write today.

Landis Machine Company, Waynesboro, Pa.





NEW DEPARTURE

Full Speed Ahead!

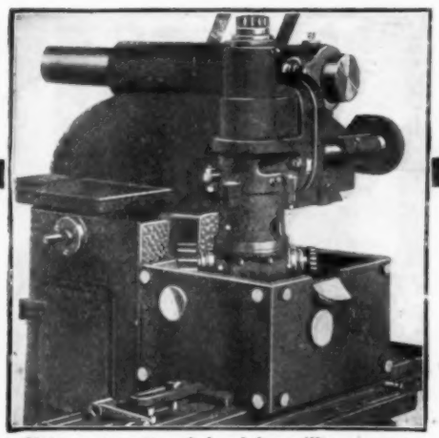
Success awaits the manufacturers who can best meet the enormous demands of post-war business.

To get the best out of machines, put the best into them—New Departure Ball Bearings.

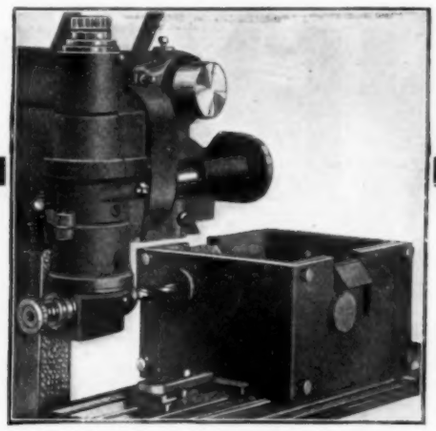
Let all moving parts turn on these efficient conservers of mechanical energy. Reduce friction, increase speed and production; cut down oil consumption and wear, increase accuracy and prolong life—produce more goods at less manufacturing cost.

A consultation with our sales engineers will help you immediately to "Full Speed Ahead!"

THE NEW DEPARTURE MANUFACTURING CO.,
Bristol, Conn. 484 Detroit, Mich.
Conrad Patent Licensee.



Using cutter in sub-head for milling across a corner on inside of box.



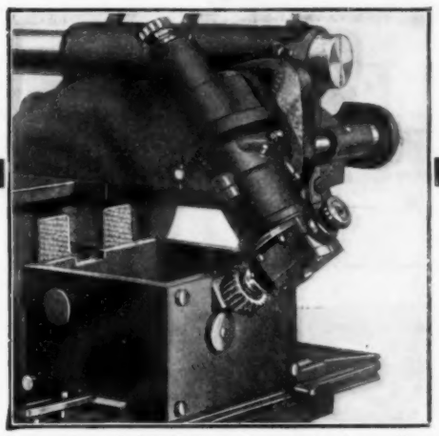
A drilling or boring operation with drill or tool held in subhead.

The No. 2

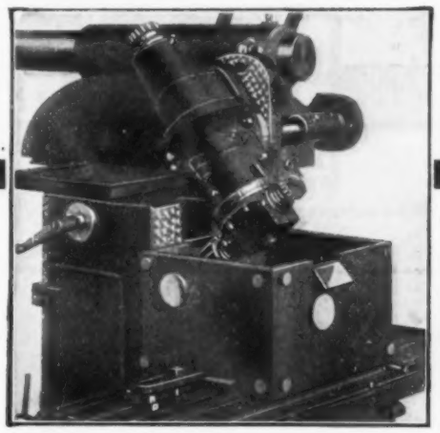
With Cutter Head Set to Operate in Vertical Position.

Flat Surfaces, Angles and Curves in practically any plane on the

VAN NORMAN



Cutter in sub-head operation on angle surface 15 inches away from face of column of machine.



Cutter in sub-head milling on angular surface close to the face of the column.

A tool room minus the Van Norman lacks life—such vitality, responsiveness and versatility has this "Duplex." Three machines together can seldom perform so many extraordinary operations.

Due to the wide range of quick shifts combined in the Adjustable Cutter Head and Movable Ram, any angle from vertical to horizontal can be attained.

The Ram has an adjustment in and out across the table.

These features, combined with the use of a sub-head attachable to the face of the main head, enable an infinite number of cutting angles and working positions.

Find out this many-featured machine

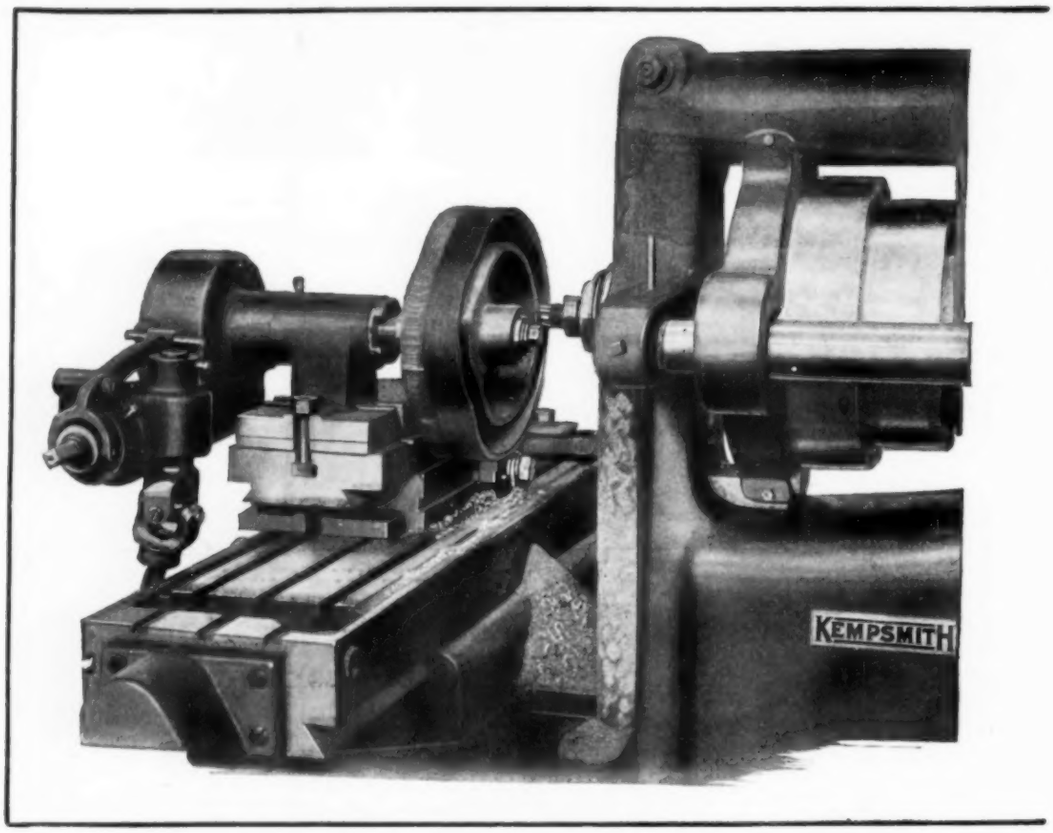
Van Norman Machine Tool Company

Office and Factory
Wilbraham Ave., Springfield, Mass.

Branch Office
74 Brush St., Detroit, Michigan

Agents for Great Britain, Alfred Herbert, Ltd.

KEMPSMITH MILLERS



Machining Cams on No. 2 Kempsmith Plain with Cam Attachment

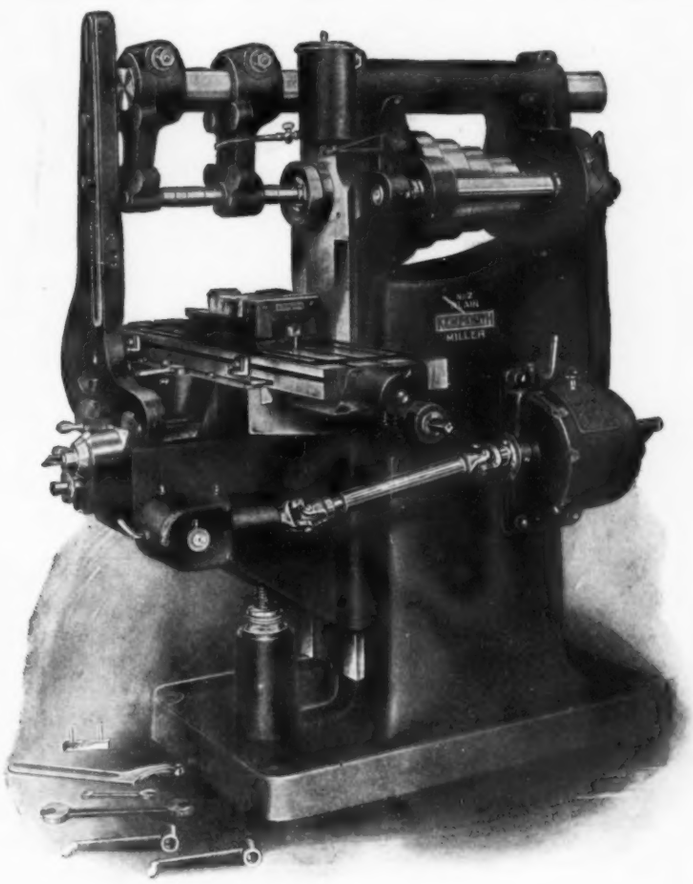
1⅛ in. diameter High Speed End Mill is used. A rough cut is taken with cutter running at 220 R.P.M., and feed of 1-1/10 in. per minute. Time for roughing cam, floor to floor, is 18 minutes. For the finishing cut a 1¼-in. diameter end mill is used, running at 220 R.P.M., and a feed of 2.42 in. per minute. Floor to floor time finishing is eleven minutes. Time completed roughing and finishing one cam—29 minutes.

KEMPSMITH

THE KEMPSMITH MFG. CO
MILWAUKEE U.S.A.

The Work they do is the reason for their Popularity

Kempsmith Plain Milling Machines are powerful and rigid; can be driven hard on tough materials, are suitable for gang milling—produce always, and suitable on any class of work.



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GEOMETRIC
¼ SIZE
STYLE D
U.S.
U.S.
U.S.

We wish you all a very Merry XMAS and a

GEOMETRIC

NEW YEAR

Which in the parlance of the thread-cutting world means a Very Happy New Year indeed

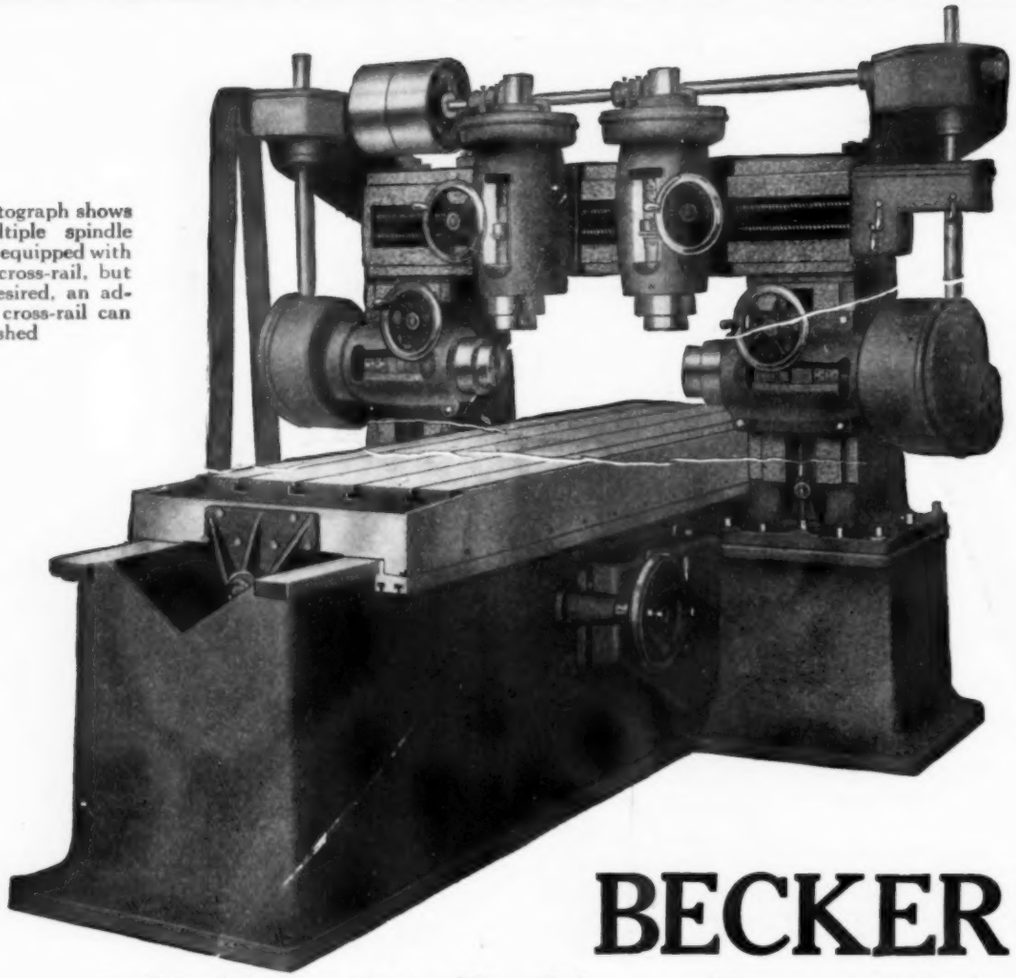
The Geometric Tool Company

New Haven, Conn.

REGULAR AGENTS: The Chas. A. Strelinger Co., Detroit, Mich.; Hill, Clarke & Co., Boston; Vandyck-Churchill Co., New York and Philadelphia; Brown & Zortman Machinery Co., Pittsburgh, Pa.; The E. A. Kinsey Co., Cincinnati, Ohio; The National Supply Co., Toledo, Ohio; Strong, Carlisle & Hammond Co., Cleveland, Ohio. PACIFIC COAST AGENTS: The Tool Equipment Co., San Francisco, Calif. CANADA: The A. R. Williams Machinery Co., Ltd. Toronto, Winnipeg and St. John, N. B.; Williams & Wilson, Ltd., Montreal.

FOREIGN: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Glasgow; E. Isbecque & Co., Brussels, Belgium.

REGULAR AGENTS: V. Lowener, Christiania, Stockholm and Copenhagen; Bevan & Edwards, Pty., Ltd., Melbourne, and White & Rae, Sydney, Australia; The Allied Machinery Co. of America in France, Switzerland, Italy, Spain and Portugal; J. Hortsman, Paris. Also manufacturers of Screw Machines and Turret Lathes.



The photograph shows the multiple spindle machine equipped with a fixed cross-rail, but when desired, an adjustable cross-rail can be furnished

BECKER

Improved Multiple Spindle Planer Type Milling Machine

An important addition to the Becker Line and a potent factor in machine shop production

The Bed is very rigid and well braced with internal ribs, it is properly proportioned to accommodate the work to be done.

The Table, of length and width to suit requirements, is operated by a feed screw of large diameter and is provided with power rapid traverse in either direction and fast intermittent feed between cuts as well as hand feed for setting up work.

Spindles are of Machinery Steel accurately ground and are carried in saddles of the Becker "Barrel" Type Construction. Each spindle is provided with in and out adjustment and a micrometer stop gauge.

Feeds and speeds are arranged to suit individual requirements and are operated through gear boxes which are centrally controlled.

As a whole, the machine is well built, rugged and very convenient to operate—a typical Becker Production Machine Tool.

Becker Planer Type Millers will increase your production.
Write for further information today—NOW.

BECKER MILLING MACHINE COMPANY

Hyde Park, Boston, Mass.

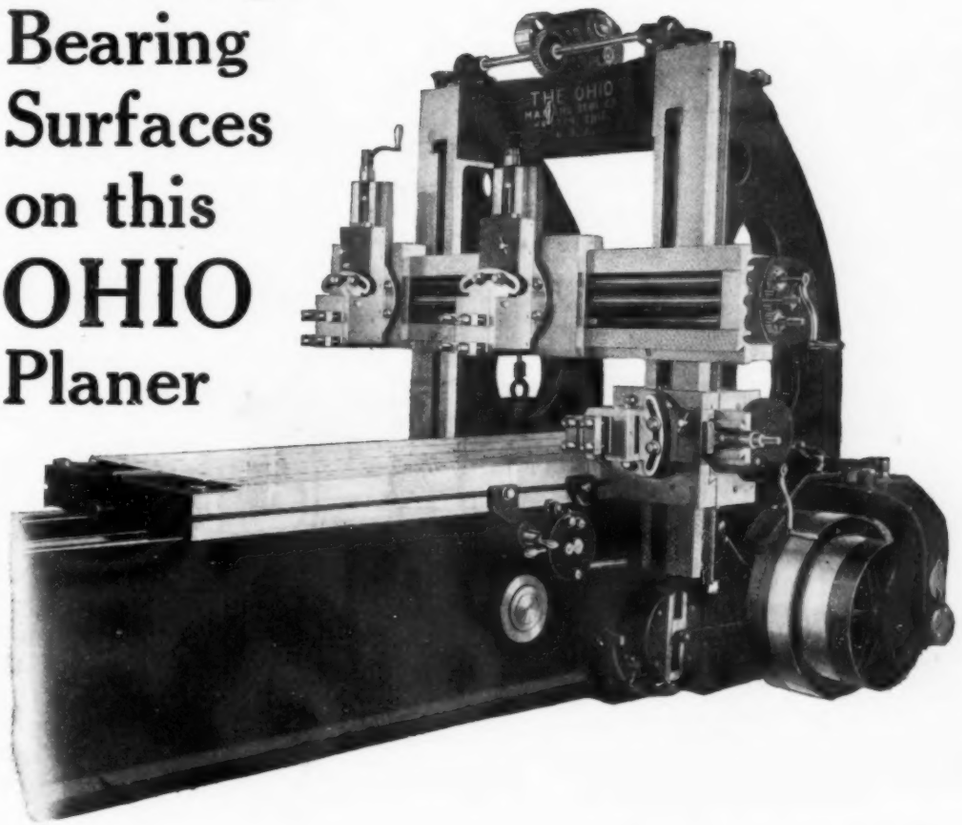
DETROIT	CLEVELAND	NEW YORK (Export)	WORCESTER	INDIANAPOLIS
529 Majestic Bldg.	408 Frankfort Ave.	24 Stone St.	134 Gold St.	940 Lemcke Annex

BUFFALO: J. L. Osgood
CHICAGO: E. L. Essley Machinery Co.
DAYTON: M. D. Larkin Supply Co.
LOS ANGELES: Niles-Bement-Pond Co.
MILWAUKEE: E. L. Essley Machinery Co.
MOLINE: E. L. Essley Machinery Co.
MONTREAL: Rudel-Belnap Co.
NEW HAVEN: Manning, Maxwell & Moore
NEW YORK: Manning, Maxwell & Moore
PHILADELPHIA: Manning, Maxwell & Moor
PITTSBURGH: Manning, Maxwell & Moore
SAN FRANCISCO: Niles-Bement-Pond Co.
SEATTLE: Niles-Bement-Pond Co.
SYRACUSE: H. A. Smith Machinery Co.
TORONTO: A. R. Williams Machinery Co.

OHIO

NOTE the Large Bearing Surfaces on this OHIO Planer

"Planers and Shapers Since 1887"



Isn't a look at this machine tool sufficient to show that it will stand behind any cut the tool can take?

Its extremely large bearing surfaces and general massive construction make POWER its outstanding feature.

This "Ohio" 42 x 42 in. Heavy Duty Planer can be had with any length of table—with one, two, three or four heads and with belt or motor drive. It embodies every modern device necessary to a machine tool of this class. Over thirty years of planer manufacture place us in a position to produce a tool that will operate smooth and accurate after long continued service. Our literature treats of planer features you should know.

Send for your copy today

The Ohio Machine Tool Co.

Leighton Street, Kenton, Ohio.

AGENTS: Pittsburgh, Laughlin & Barney Machinery Company; Cleveland, W. M. Pattison Supply Company; Chicago, Dale-Brewster Machinery Company; Philadelphia and Baltimore, Luster Machinery Company; Toledo, Coghlin Machinery & Supply Company; New York City, Garvin Machine Company; Providence, Brownell Machinery Company; Hartford, Purinton & Smith Machinery Company; Boston, Factory & Mills Supply Company; Syracuse, H. A. Smith Machinery Company; Grand Rapids, McMullen Machinery Company; Detroit, English & Miller Machinery Company; St. Louis, Colcord-Wright Machinery & Supply Company; Indianapolis, Vonnegut Machinery Company; San Francisco, General Machinery and Supply Company; New Orleans, P. H. McArdle; Portland, Ore., Pacific Engineering & Equipment Company; Seattle, Westcoast Machinery Company; Los Angeles, Shaw, Palmer, Bakewell; Omaha, Sunderland Machinery & Supply Company; Salt Lake City, American Machinery Company; Milwaukee, Badger-Packard Machinery Company (planers).

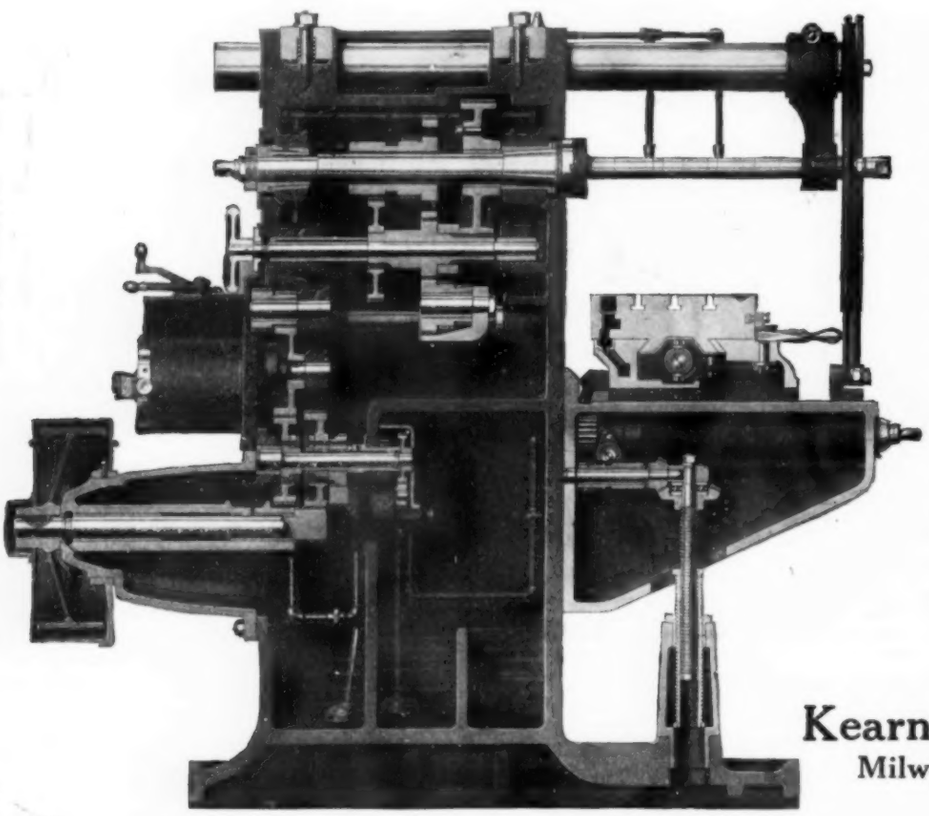
Automatic Flooded Lubrication

The automatic flooded lubrication, a patented and exclusive feature of Milwaukee Milling Machines, is one of the most potent factors in the excellent service and results given by these machines.

The lubricant is stored in a reservoir in the base of the machine and pumped to the top where it is distributed by a perforated pipe, flooding downward through all bearings and over all gears and constantly lubricating. The oil grooves in the bearings are cut through to permit the oil to flow freely, thoroughly lubricating and washing away all foreign substances that otherwise would cause heating and scoring of the surfaces.

The cutter lubricating system is also of great importance in these days of high speed steel and heavy rapid milling, as every milling machine sooner or later will operate on steel. The cutter lubricant is stored in a reservoir in the base of the machine and is pumped to the top by a simple spur geared pump and flooded over the cutters by adjustable nozzles. The lubricant is returned through the screened pockets and telescopic tubing to another reservoir in the base of the machine which acts as a setting tank so that no chips will be carried over into the reservoir from which the oil is pumped to the cutters. An effective system of cutter lubrication adds to the productivity of the cutters, prolonging their term of usefulness and lengthening the intervals between sharpenings.

Every Milwaukee Milling Machine is equipped with a cutter lubricating system if so ordered or not. The pump used in connection with the automatic lubricating system is double, one side being used for internal lubrication of gears and bearings and the other side for the lubrication of cutters. The construction is such that the pump for lubricating the gears and bearings operates all the time that the drive pulley is running, whereas, the pump for lubricating cutters operates only when the spindle is revolving. The advantage of this is obvious. If the pump for lubricating the cutter ran all the time that the pulley was running, it would be necessary for the operator to shut off the flood of oil every time he stopped the cutter to change the work. The pump for lubricating the gears and bearings is kept constantly running so that the pulley shaft is always thoroughly lubricated even though the spindle is idle.



Catalogue No. 21 gives the complete story.

Write for a copy.

Kearney & Trecker Co.
Milwaukee, Wis., U. S. A.

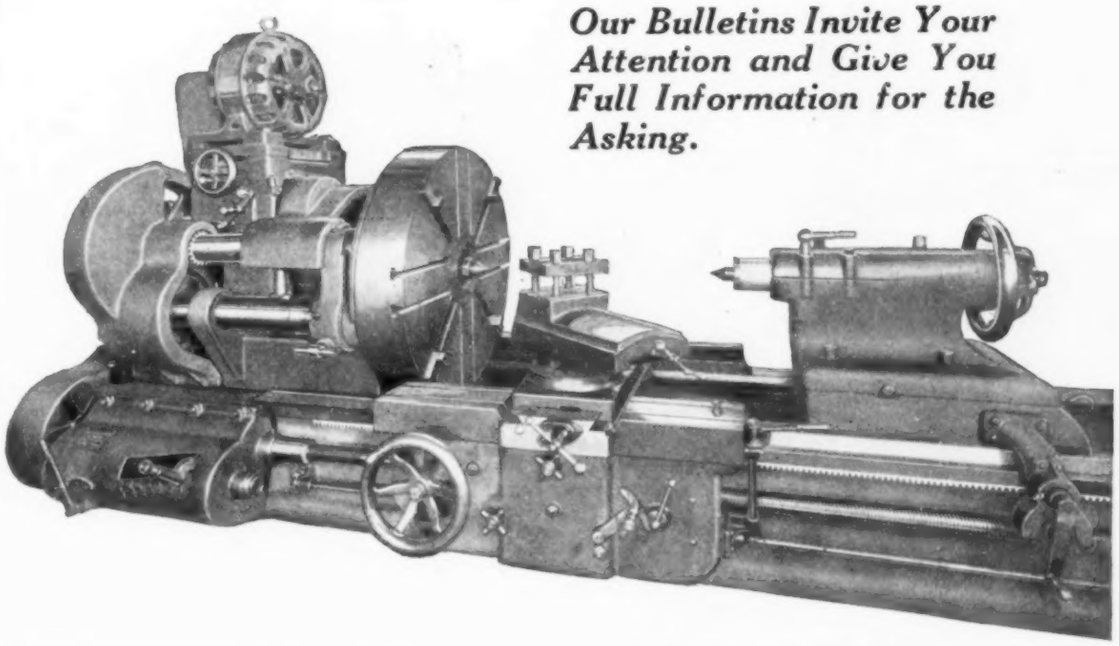
MILWAUKEE MILLING MACHINES

PITTSBURGH

A C D C
Belt or Chain Drive
Make Pittsburgh Lathes
Possible and Practical
Everywhere

Absolute Accuracy—
Perfect Balance—
Rigorous Strength—

Our Bulletins Invite Your Attention and Give You Full Information for the Asking.



PITTSBURGH MACHINE TOOL CO.
Braddock, Pa., U. S. A.

OR THE FOLLOWING AGENTS: Swind Machinery Co., Philadelphia, Pa.; Backer Machine Tool Supply Co., New York; Thompson Machinery Co., Pittsburgh, Pa.; Wolverine Machinery & Supply Co., Detroit, Mich. Hendey Machine Co., Chicago, Ill. Eccles & Smith Co., Seattle, Wash., and Portland, Ore. Harold A. Wright, 50 Court St., Boston, Mass. Wm. C. Johnson & Sons Mchy. Co., 1001-3-5 N. Sixth St., St. Louis, Mo.

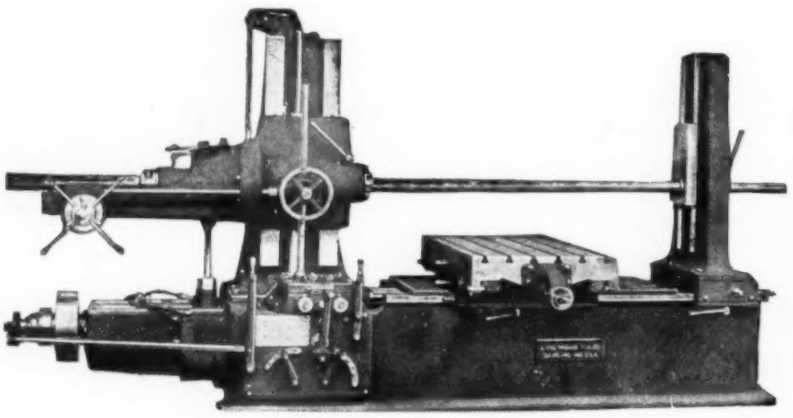
The LUCAS "PRECISION"

Boring, Drilling and MILLING MACHINE

LUCAS "Precision" is known in every up-to-date manufacturing plant in the country. On jobs requiring several machining operations it is practically indispensable.

Why? Because it accomplishes drilling, boring, reaming and milling with a single set-up of the work. And it is capable of performing these varied operations with an accuracy of .001 in. in 1 ft.

Surely such performance should interest you enough to send for full details.



LUCAS Machine Tool Co.

Cleveland
Ohio, U. S. A.

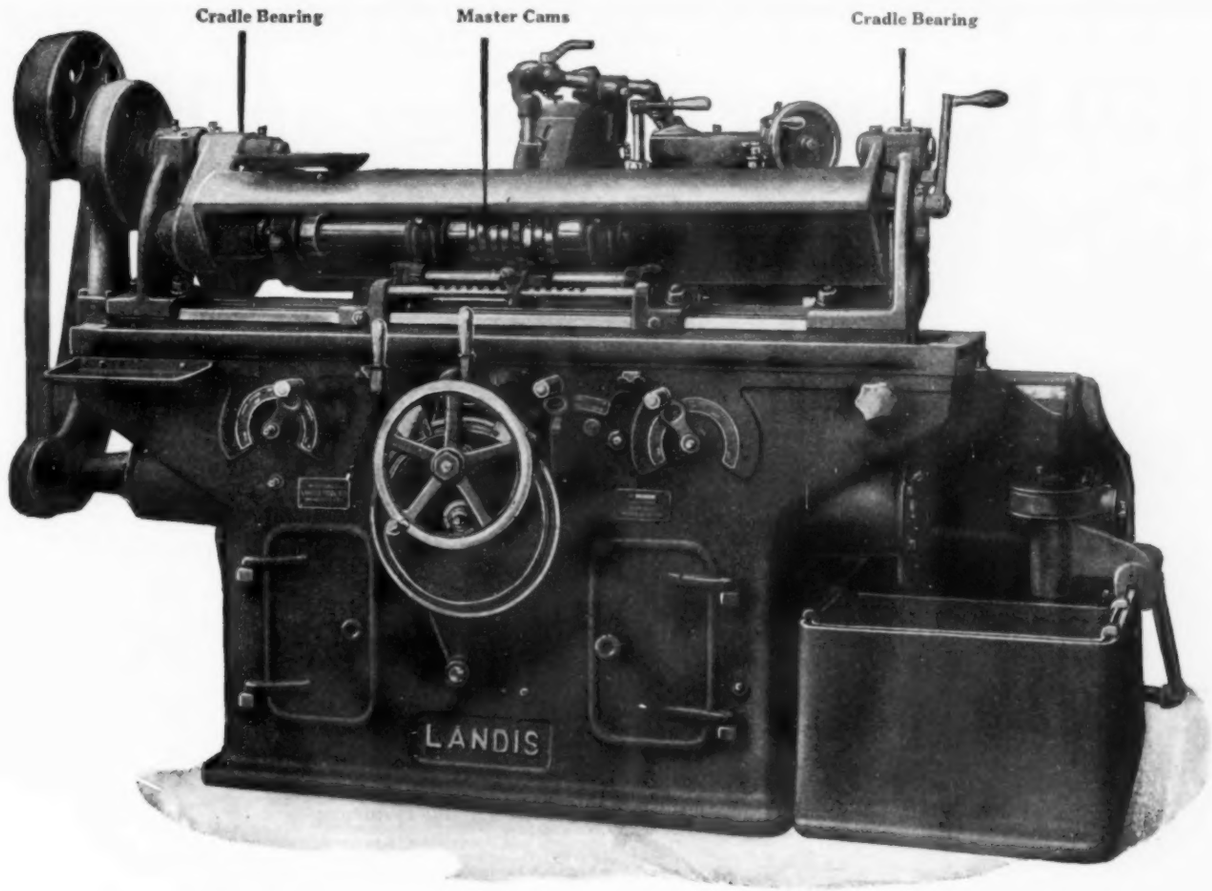
NOW AND ALWAYS OF

Alfred Herbert, Ltd., Coventry; Societe Anonyme Alfred Herbert, Paris; Societe Anonyme Belge Alfred Herbert, Brussels; Allied Machinery Co., Turin, Barcelona, Zurich; Benson Bros., Sydney, Melbourne; V. Lowener, Copenhagen, Christiania, Stockholm; R. S. Stokvis & Zonen, Rotterdam; Andrews & George Co., Tokyo.

The Janitor and the Librarian

were one and the same man. He was versatile for the reason that previous to 9 o'clock in the morning his duties required a knowledge of janitorship, while after that hour he assumed the role of Librarian.

If you are engaged in the automotive or any similar manufacturing business you will find the Lucas just the machine you need. It will bore early in the morning, drill in mid-forenoon, and mill till the closing hour or all three at one setting at any time.



The Landis Way Pleases

A typical report from one of the Landis Service men with reference to a recent call in a large plant using Landis equipment on automobile work, reads as follows:

> ***"I find everything working in a satisfactory manner. They are now turning out 400 six-cylinder cam shafts per day on our machines, and are very much pleased with the results obtained."***

The LANDIS Integral Cam Grinding Machine will grind cams of any shape or size, in any combination of cams. The machine accurately reproduces a master cam which operates in contact with a hardened roller, giving a swinging motion to the table, and reproducing the master cam in the work.

Many manufacturers are grinding their duplicate cams on the LANDIS—as well as using LANDIS Machines on all other forms of grinding. Write for full LANDIS details.

LANDIS TOOL CO., Waynesboro, Pa.

New York Office, 50 Church St.

DOMESTIC AGENTS: Dewstoe Machine Tool Co., Birmingham; Elliott & Stephens Machinery Co., St. Louis; F. C. Richmond Machinery Co., Salt Lake City; Hallidie Machinery Company, Seattle; Harron, Rickard & McCone, San Francisco and Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Seeger Machine Tool Co., Atlanta; Sheehan-North Co., El Paso. CANADIAN AGENTS: A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal. FOREIGN AGENTS: Allied Machinery Co., Paris, Turin, Barcelona, Brussels, Zurich and Lisbon; Anderson, Meyer & Co., Ltd., Shanghai; Andrews & George Co., Ltd., Tokyo; Benson Brothers, Sydney and Melbourne; Burton, Griffiths & Co., Ltd., London; B. S. Stokvis & Zonen, Rotterdam; Wilh. Sonesson & Co., Malmo and Copenhagen.

120 Adapter Bushings an Hour

THIS is being done on a Cincinnati Acme Screw Machine in the plant of the Delta Electric Company, Marion, Indiana.

Turn, face, drill, thread, counterbore and cut-off—these are the operations required on each bushing.

This concern is thoroughly satisfied with the Cincinnati Acme.

Specify Cincinnati Acme Screw Machines and Turret Lathes and Increase your profits

The Acme Machine Tool Co.
Cincinnati, Ohio

Flat Turret Lathes—Screw Machines—Turret Lathes

DOMESTIC: Henry Prentiss & Co., Inc. New York City; Boston, Mass.; Buffalo, N. Y.; Syracuse, N. Y.; Rochester, N. Y. Motch & Merryweather Machinery Co., Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.; Cincinnati, Ohio. Marshall & Huschart Machinery Co., Chicago, Ill. Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Ind. Elliott & Stephens Machinery Co., St. Louis, Mo. W. E. Shipley Machinery Co., Philadelphia, Pa. Kemp Machinery Co., Baltimore, Md.; Seeger Machine Tool Co., Atlanta, Ga. C. T. Patterson Co., New Orleans, La. Zimmerman-Wells-Brown Co., Portland, Ore. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Dewstoe Machine Tool Co., Birmingham, Ala.

FOREIGN: Aux Forges de Vulcain, Paris, France. Geo. H. Alexander, Birmingham, England. H. P. Gregory & Co., Sydney, Australia. J. Lambercier & Co., Geneva, Switzerland. Chr. A. Herstad, Copenhagen, Denmark and Stockholm, Sweden. Gustav Nielsen, A/S, Christiania, Norway; C. Schinz, Petrograd, Russia; Maskin-Aktiebolaget E. Gronblom, Abo, Finland. E. Isbecque & Co., Brussels, Belgium. Andrews & George Co., Tokyo, Japan. The American Machinery Syndicate, 35-37 W. 39th St., New York City.

CANADIAN: Rudel-Belnap Machinery Co., Montreal, Toronto.

The Xmas Spirit

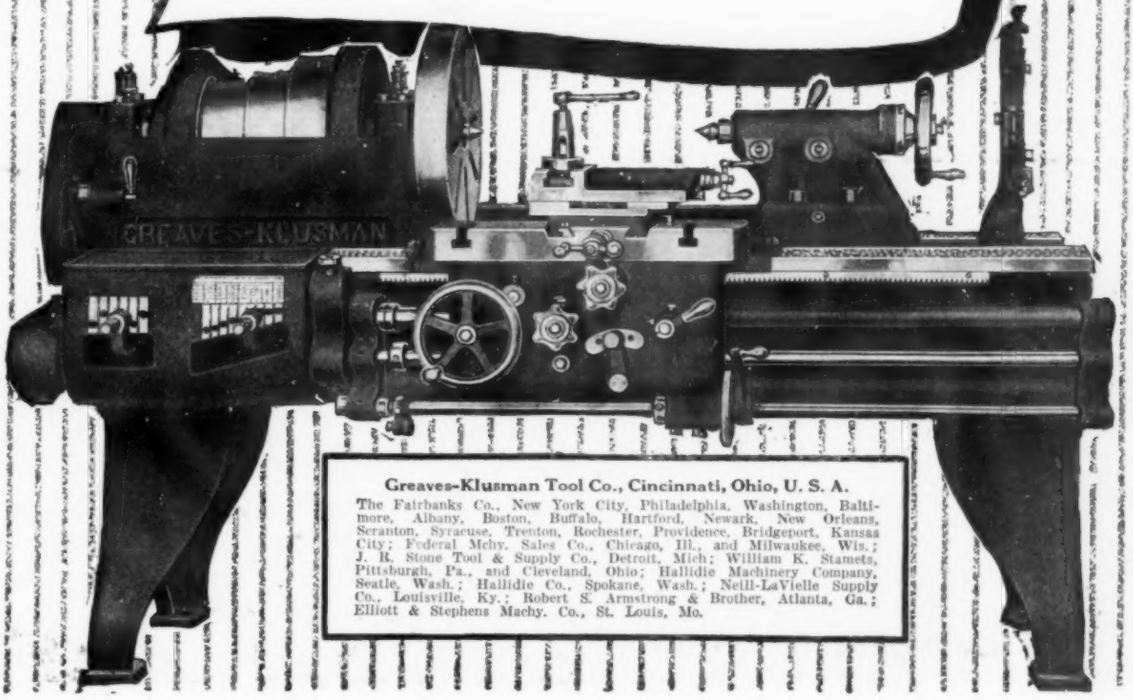
should not be confined to a single day in the year. *Every* day should be one of good will and contentment, and it will be if you install

GK

G-K-Lathes

They are powerful and accurate in operation. There are no complications to confuse the workman. The day's production sheet is pleasing both to runner and owner and a happy workman is an asset. Ask for and study the details. You'll see why these tools will improve the tone of your plant.

GK



Greaves-Klusman Tool Co., Cincinnati, Ohio, U. S. A.

The Fairbanks Co., New York City, Philadelphia, Washington, Baltimore, Albany, Boston, Buffalo, Hartford, Newark, New Orleans, Scranton, Syracuse, Trenton, Rochester, Providence, Bridgeport, Kansas City; Federal Mchy. Sales Co., Chicago, Ill., and Milwaukee, Wis.; J. R. Stone Tool & Supply Co., Detroit, Mich; William K. Stamets, Pittsburgh, Pa., and Cleveland, Ohio; Hallidie Machinery Company, Seattle, Wash.; Hallidie Co., Spokane, Wash.; Neill-LaVielle Supply Co., Louisville, Ky.; Robert S. Armstrong & Brother, Atlanta, Ga.; Elliott & Stephens Machy. Co., St. Louis, Mo.

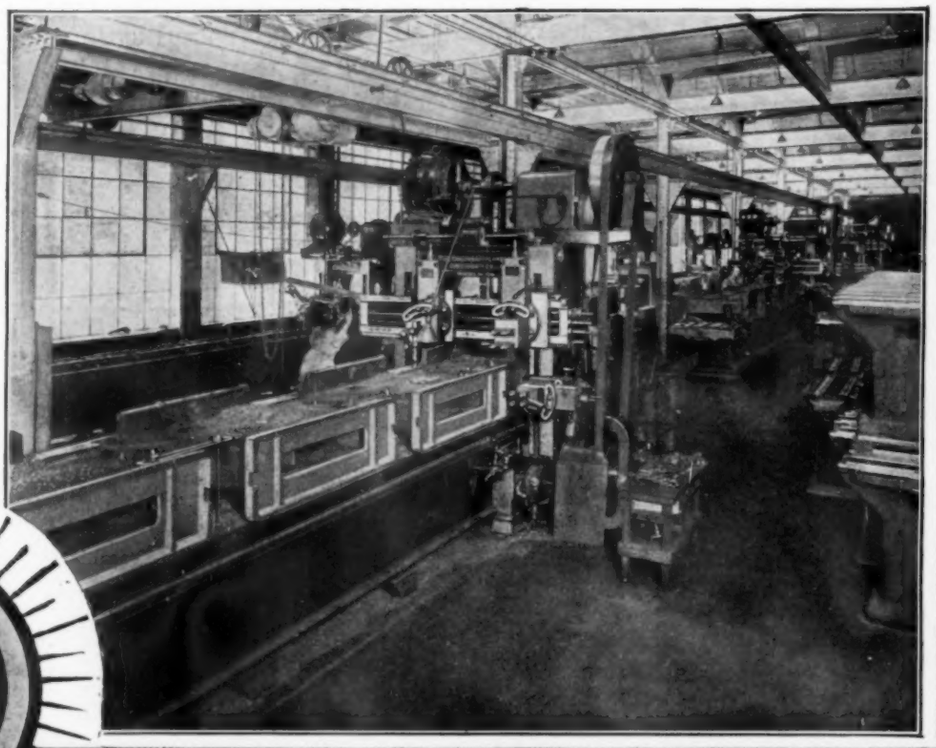
CINCI

PLANERS

An authority speaks!

"The Cincinnati Planer is well designed, powerful, speedy." So says the shop foreman of the Heald Machine Company. Those who know the quality of Heald products know the value of this testimony. The illustration shows the Cincinnati planing the base castings for the Heald No. 70 internal grinder—three at a time. Limits of accuracy are + .0015 in., — .002 in. Eight pieces per day are turned out.

Get our Catalog. It will show you why the Cincinnatis are preferred by experts.



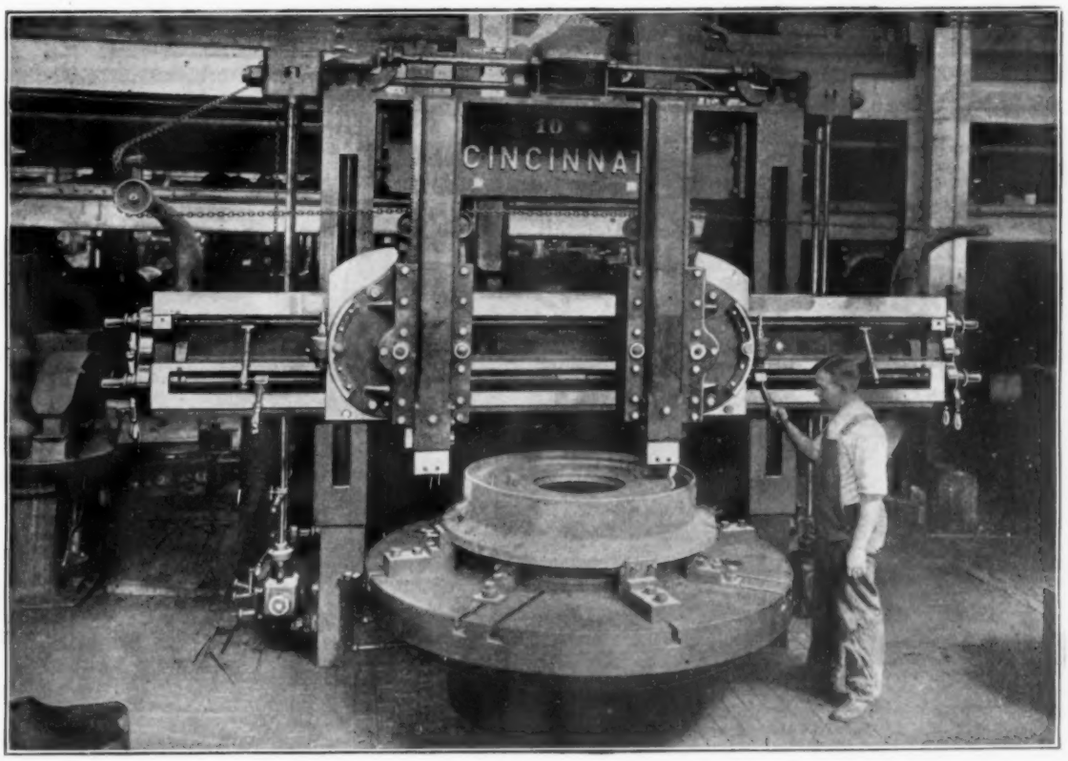
CINCINNATI PLANER CO.
Cincinnati, Ohio, U.S.A.

INNATI
BORING MILLS

One of the General Electric's uses of the Cincinnati

Here we see the Cincinnati Boring Mill in the Schenectady plant of the General Electric Co., boring, facing, turning and cutting dovetails in a turbine diaphragm.
Wherever you find products of quality you will find the Cincinnati close by. And there are very good reasons why.

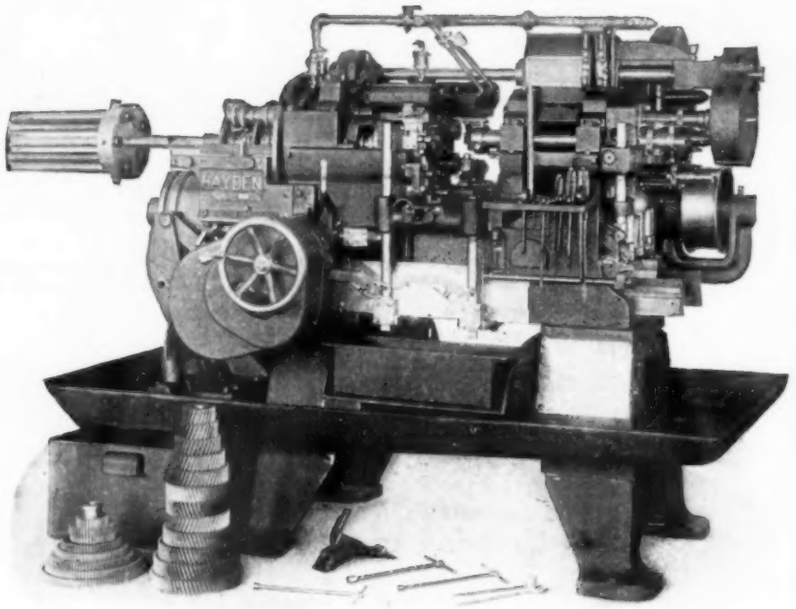
Our Catalog gives them all. Write for it today.



DOMESTIC AGENTS: Henry Prentiss & Co., Inc., New York, Boston, Buffalo, Syracuse, Rochester; Motch & Merryweather Machinery Co., Cleveland, Detroit, Pittsburgh, Cincinnati; Marshall & Huschart Machinery Co., Chicago, Indianapolis; Elliott-Stephens Machinery Co., St. Louis; W. E. Shipley Machinery Co., Philadelphia; Kemp Machinery Co., Baltimore; Seeger Machine Tool Co., Atlanta; C. T. Patterson Co., New Orleans; Eccles & Smith Co., San Francisco and Los Angeles; Zimmerman, Wells & Brown Co., Portland; Hallidie Machinery Co., Seattle and Spokane; Hendrie & Bolthoff Co., Denver. CANADIAN AGENTS: Rudel-Belnap Machinery Co., Toronto and Montreal. FOREIGN AGENTS: Aux Forges de Vulcain, Paris; C. Churchill & Co., London. Planers: Geo. H. Alexander, Birmingham. Boring Mills: Ing. Ercole Vaghi, Milan; J. Lambercier & Co., Geneva; Chr. A. Herstad, Copenhagen and Stockholm; Gustav Nielson, A/S, Christiania.

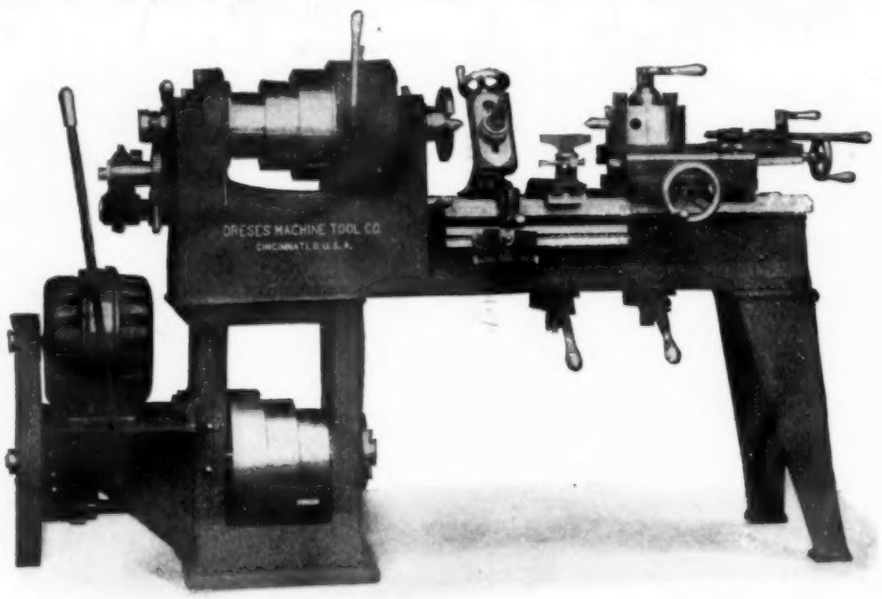
CINCINNATI

5-SPINDLE AUTOMATIC SCREW MACHINE



Cincinnati Automatic Machine Company
Oakley, Cincinnati, Ohio

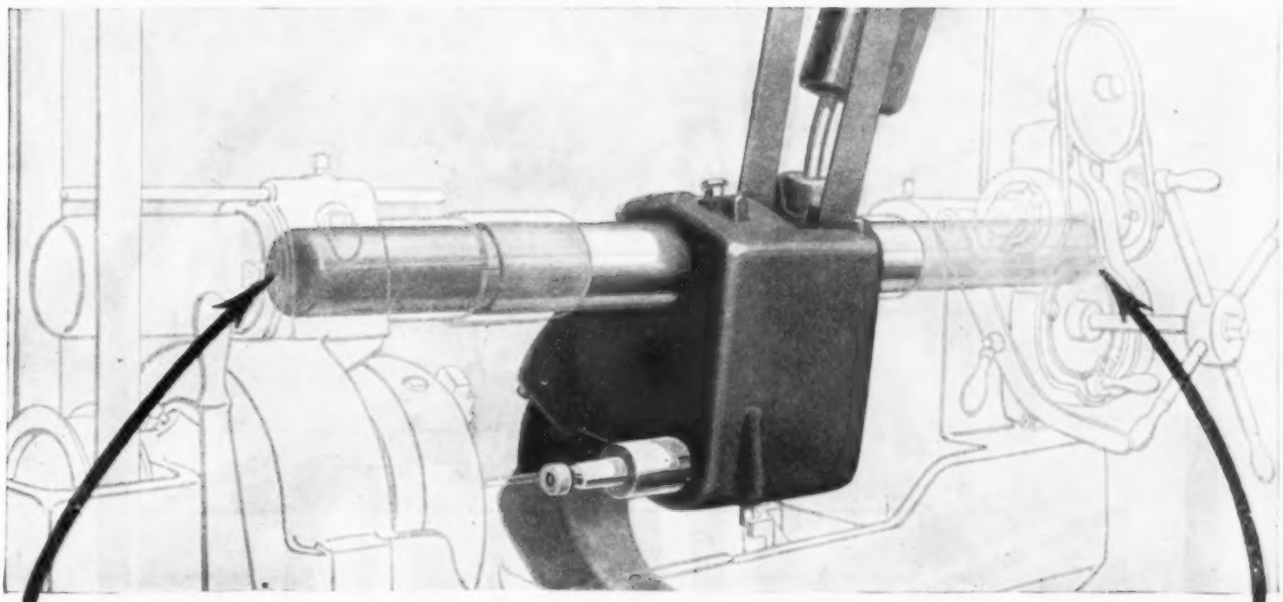
Motor Driven Turret Lathes and Screw Machines



Geared speed changing devices are not practicable for very high speeds. The motor mounted on the head stock looks unsightly and sets up undesirable vibrations. We place the motor on a bracket close to the floor, where it takes up little room, reduces the vibration and allows a long belt for the pulleys. A rawhide pinion on the armature shaft insures noiseless running. A mechanical friction clutch starting, stopping and reversing device between the motor and lower shaft eliminates an expensive and complicated electrical controlling arrangement.
For variable speed motors single pulleys instead of cone pulleys are used.

DRESES MACHINE TOOL CO., Cincinnati, Ohio, U. S. A.

REPRESENTATIVES: Carey Machinery & Supply Co., Baltimore, Md.; E. L. Essley Machinery Co., Chicago; Badger-Packard Machinery Co., Milwaukee; Wm. C. Johnson & Sons Machinery Co., St. Louis; Canadian Fairbanks Company, Montreal and Toronto; Selson Engineering Co., London; Stussi & Zweifel, Milan; Manning, Maxwell & Moore, Mexico City and Yokohama, Japan.



Note this long, substantial bearing

THIS is one reason why you can drive the BRYANT with an exceptionally heavy feed without vibration or chatter. Because of its wide bearing surface the long, heavy slide bar gives an unusual degree of stability.

This heavy feed feature coupled with the system of diameter control with its resulting "2 to 1" accuracy, the control plate method of grinding taper and formed holes and the ease with which work can be gauged makes the BRYANT Hole Grinders superior producers.

Send us a sample of your requirements in the line of hole grinding—Let us tell you what the BRYANT design will do for your production.

BRYANT CHUCKING GRINDER COMPANY

Springfield, Vermont, U. S. A.

Detroit Office, 67 Shelby St., Detroit. Chicago, Direct Representative, 1352 Bryn Mawr Ave., Chicago. Motch & Merryweather Mchy. Co., Agents in Cleveland, Cincinnati and Pittsburgh. Henry Prentiss & Company, Agents in New York City, Boston, Rochester, Syracuse, Buffalo and Scranton. Berger & Carter Company, Agents in San Francisco and Los Angeles.

Rapid Production HAMILTON Machine Tools

The 16-inch Hamilton Rapid Production Lathe is shown here. This is merely one of the Hamilton line. Highest possible quality has ever been the Hamilton motto. On this account Hamilton Lathes are extremely economical and reliable.

Write for Bulletins, giving complete information.

THE HAMILTON MACHINE TOOL CO.

Hamilton, Ohio, U. S. A.

DOMESTIC AGENTS: Machine Shop Equipment Corp., Boston, Mass.; Barbour, Love & Woodward, Inc., 149 Broadway, New York; Syracuse Supply Co., Rochester, N. Y., Syracuse, N. Y., Buffalo, N. Y.; Monarch Machinery Co., Philadelphia, Pa.; Thomson Machinery Co., Pittsburgh, Pa.; Co-operative Machinery Co., Cleveland, Ohio; Osborn & Sexton Machinery Co., Columbus, Ohio; Wolverine Machinery & Supply Co., Detroit, Mich.; Stocker-Rumely-Wachs Co., Chicago, Ill.; Thomson Tool & Supply Co., Indianapolis, Ind.; W. C. Johnson & Sons Machinery Co., St. Louis, Mo.; F. E. Satterlee Co., Minneapolis, Minn.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Herberts Machinery & Supply Co., Los Angeles, Calif., San Francisco, Calif.; M. J. Walsh Machinery Co., Milwaukee, Wis.; Textile Mill Supply Co., Charlotte, N. C.; General Fire Extinguisher Co., Atlanta, Ga.; Oliver H. Van Horn, Inc., New Orleans, La.

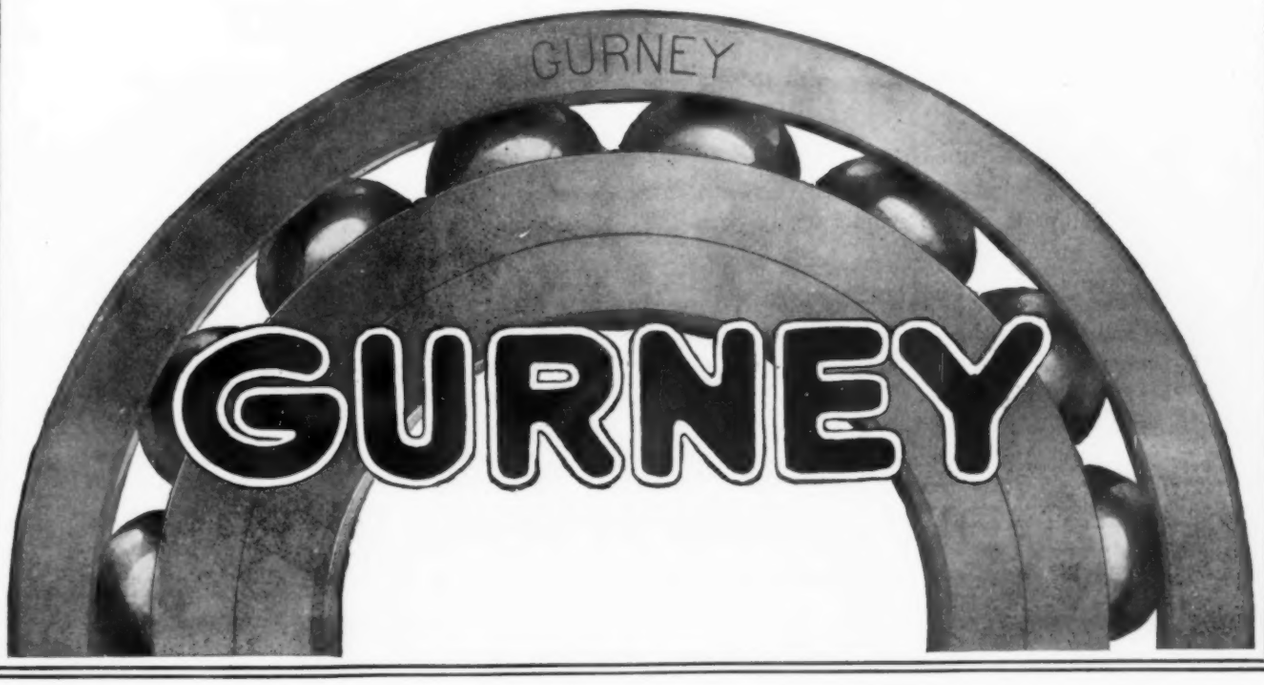
CANADIAN AGENTS: H. W. Petrie, Ltd., Toronto, Ont., Canada.

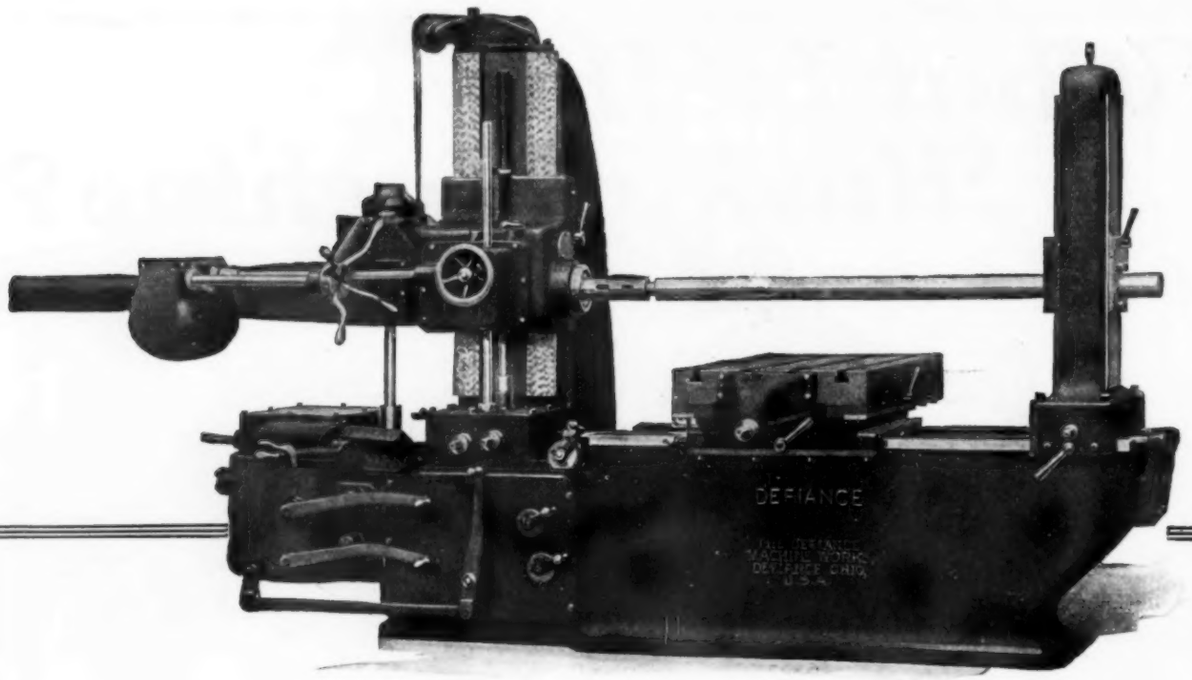
What Is This Husky Machine?

It is a special grinder for grinding the worms for Fordson Tractors. The wheel is dressed V-shaped to properly form the thread of this big worm. To do this satisfactorily the wheel must be held against all vibration or chatter either radial or sidewise. And this absolute rigidity must be held permanently and of course without interfering with the free running of the wheel. These worms must be ground smooth and true and they must be produced in quantity in the true Ford fashion.

Accordingly Mr. Ford does the logical thing to make sure of these results, mounts the spindles of these machines on Gurney Radio-Thrust Bearings.

Gurney Ball Bearing Co.
Conrad Patent Licensee
Jamestown, N. Y.





The Defiance No. 5 Horizontal Boring, Milling, Drilling and Tapping Machine

If You Need a Boring Mill—You Need a Defiance

Because, in addition to all essential features heretofore used in a machine of its kind, the Defiance Horizontal Boring Mill has the following original features:

A roll-in gear device is used to change speeds. This method is very simple, quick, and eliminates all possibility of breakage, even when a shift is made with the gears in operation.

A complete automatic oiling system, combining a splash, force feed and gravity flow to all parts of the spindle head, speed and feed mechanism.

The contents of the spindle head, the speed and feed mechanism, are of unit construction. They are completely enclosed in tight housings which guard against the entrance of dust and cuttings.

All speeds are constant to the spindle which enables the changing of back gears without altering the feed ratio.

All transmission shafts rotate in roller bearings, and thrusts of all gears and keys are taken by ball bearings.

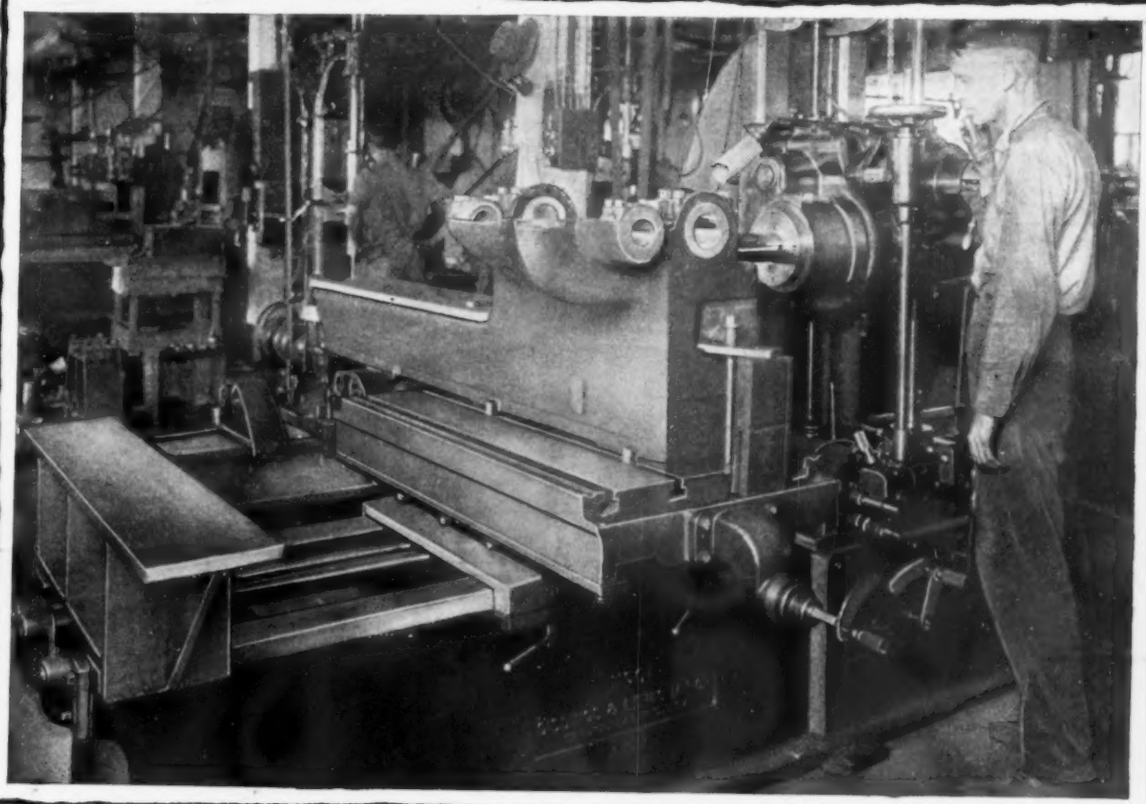
To insure rigidity, the support of the column to the spindle head—by a dovetail bearing and binder gib—is located close to the spindle nose.

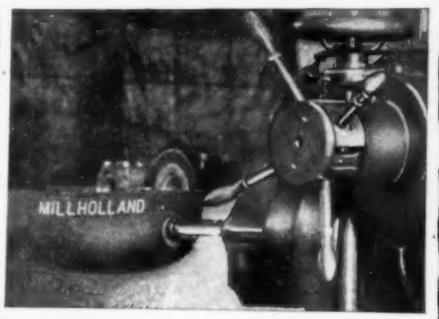
The spindle is driven by a helical gear, which absolutely eliminates chatter, and it can be reversed for tapping operations.

Absolute accuracy is possible only in self-contained machinery. The Defiance Boring Mills are made self-containing by a three point suspension.

THE DEFIANCE MACHINE WORKS

NEW YORK DEFIANCE, OHIO, U. S. A. LONDON





As Accurate as a Micrometer Says Superintendent of Millholland Machine Co.

THE illustration shows a Giddings & Lewis No. 0 Boring Machine at work in the Millholland plant. It is boring spindle bearings and other holes in the bed casting of a Millholland screw machine. The superintendent says "it is a most satisfactory machine and is as accurate as a "micrometer."

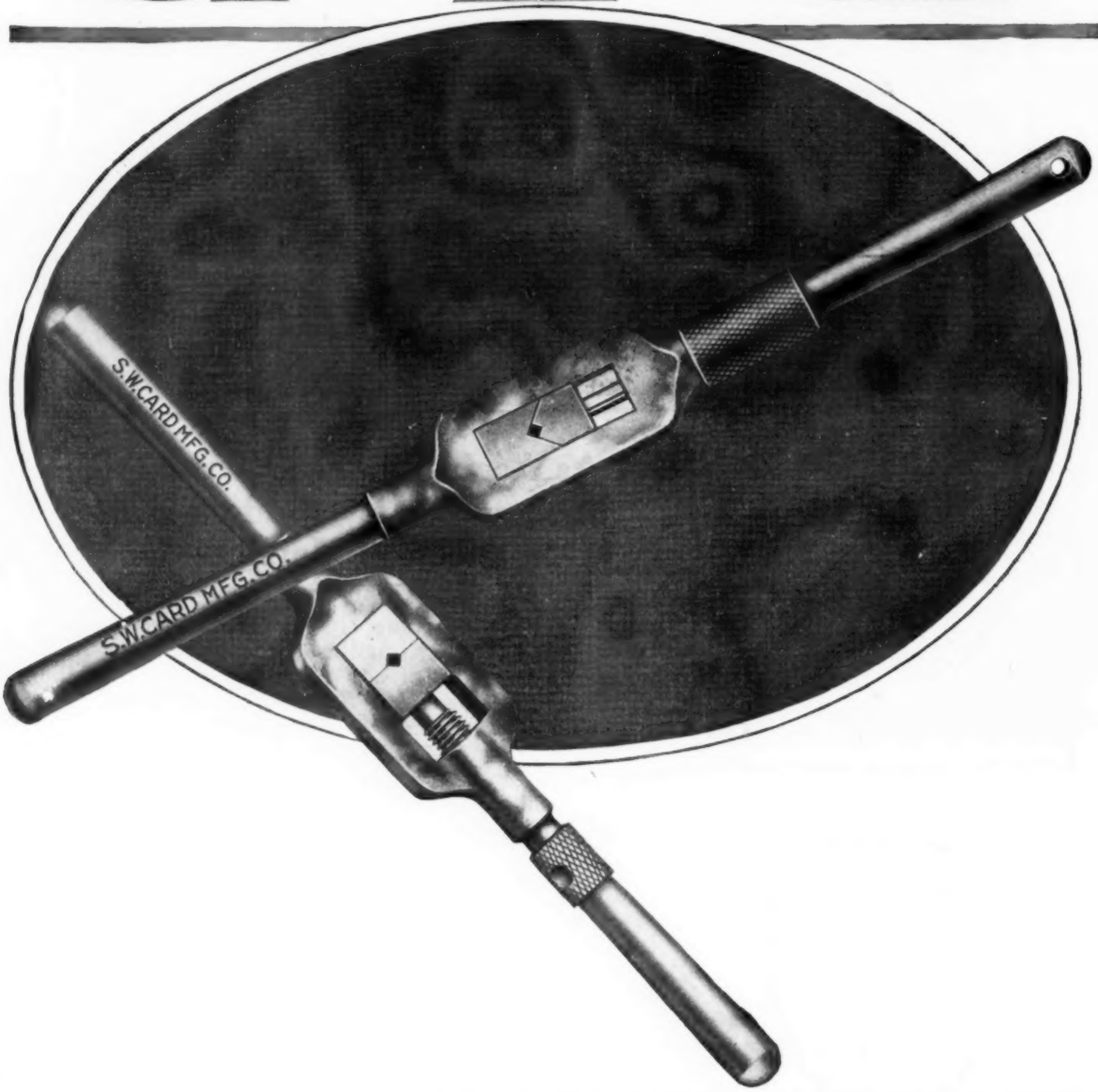
There are four styles of G. & L. Boring Machines for you to choose from and each is supreme of its kind. They combine close accuracy with unusual strength. Especially are they valuable for heavy, awkward work.

Get our descriptive bulletin

Giddings & Lewis Mfg. Co.
Fond du Lac, Wis.

DOMESTIC AGENTS: Taylor Machinery Co., Boston; Fairbanks Co., New York, Albany, New Orleans, Hartford; Kemp Machinery Co., Baltimore, Md.; Swind Machinery Co., Philadelphia; E. A. Kinsey Co., Cincinnati, Indianapolis; Marshall & Huschart Machinery Co., Chicago, Milwaukee; English Tool & Supply Co., Kansas City; Sunderland Machinery & Supply Co., Omaha; Salt Lake Hardware Co., Salt Lake City; Motch & Merryweather Machinery Co. Pittsburgh, Cleveland, Detroit; Blackman-Hill-McKee Machinery Co., St. Louis; McMullen Machinery Co., Grand Rapids, Mich.; Smith-Courtney Company, Richmond, Va.; Manning, Maxwell & Moore, Inc., Seattle; Henry Prentiss & Co., Syracuse, Rochester, Buffalo.
FOREIGN AGENTS: Canadian Fairbanks-Morse Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver; Fenwick Freres & Co., Paris, Lyons, Liege, Brussels, Zurich; Burton, Griffiths & Co., England; R. L. Scrutton & Co., Ltd., Sydney, Australia; Gustav Nielsen, Christiania; A. B. Galco, Ltd., Stockholm, Sweden; Frazer & Co., Tokyo, Japan; American Machinery Syndicate, Spain, Portugal; Maskinbolaget Groenblom, Abo, Finland; Gaston Williams & Wigmore, Shanghai, Hongkong, Hankow, Tientsin, China.

CARD



Where you can buy CARD Threading Tools

Foreign Agencies:
CHARLES CHURCHILL & CO.
London, Birmingham, Manchester, Glasgow, and Newcastle-on-Tyne.
V. LOWENER
Verterbrogade 9 B, Copenhagen, Denmark.

MARKT & CO.
Paris.
V. LOWENER'S MASKINFORRETNING
Sverre Mohn, Christiania, Norway.
C. CIVITA
Milano, Italy.

Threading Tools

Happy New Year

Standard for forty-~~five~~ six years. Need we say more?

S. W. CARD MFG. CO.

The CARD Quality

MANSFIELD, MASSACHUSETTS, U.S.A.

R. S. STOKVIS & ZONEN, LTD. Rotterdam.
J. LAMBERCIER & CO. Geneva.
V. LOWENER Drottinggatten 90, Stockholm, Sweden.

R. D'AULIGNAC Barcelona, Spain.
ATELIERS DEMOOR Brussels, Belgium.
A. M. PAPASIDERIS & CO. Athens, Greece.
ANDERSON, MEYER & CO., LTD. Shanghai, Changsha, Hankow, Harbin, Hongkong, Kalgan, Pekin, Tientsin, Vladivostok, China.
MESTRE & BLATGE Rio de Janeiro, Brazil, Buenos Aires, Argentine Republic.

Take a Squint at This—if *Heavy Duty* Drilling Interests You

Up in Oil City, Pa., is the Oil Well Supply Co.—makers of Oil Well equipment. A corner of their Imperial Works is shown on the opposite page. Also two Colburn Heavy Duty Drill Presses.

One of them is drilling the boss of an Elevator Bail; the other a drill coupling. Both pieces are of 20 to 30 carbon steel.

The hole in the drill coupling is drilled to a depth of 10 inches. The Elevator Bail is 3½ inches thick by seven inches in diameter. The hole is 4 1/16 inches in diameter and 3½ inches deep. Rate of feed 10/1000. Production 12 pieces—2 holes each—per 9-hour day.

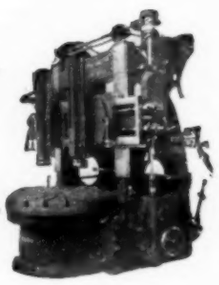
And Colburn Heavy Duty Drill Presses are *handling* these jobs in the fullest sense of the word.

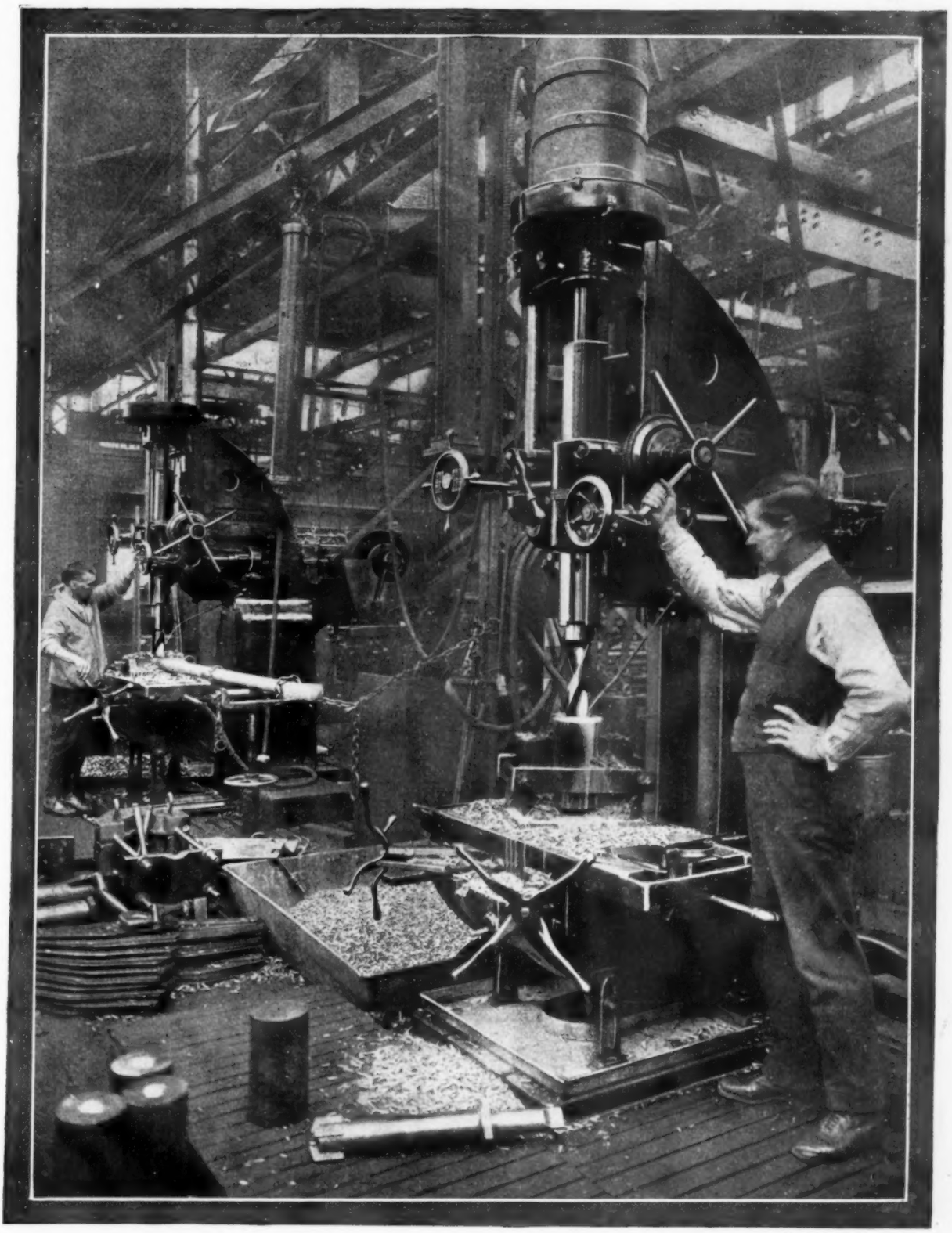
Investigate—and the Colburn will handle your work. You ought to be familiar with *all* the Colburn styles.

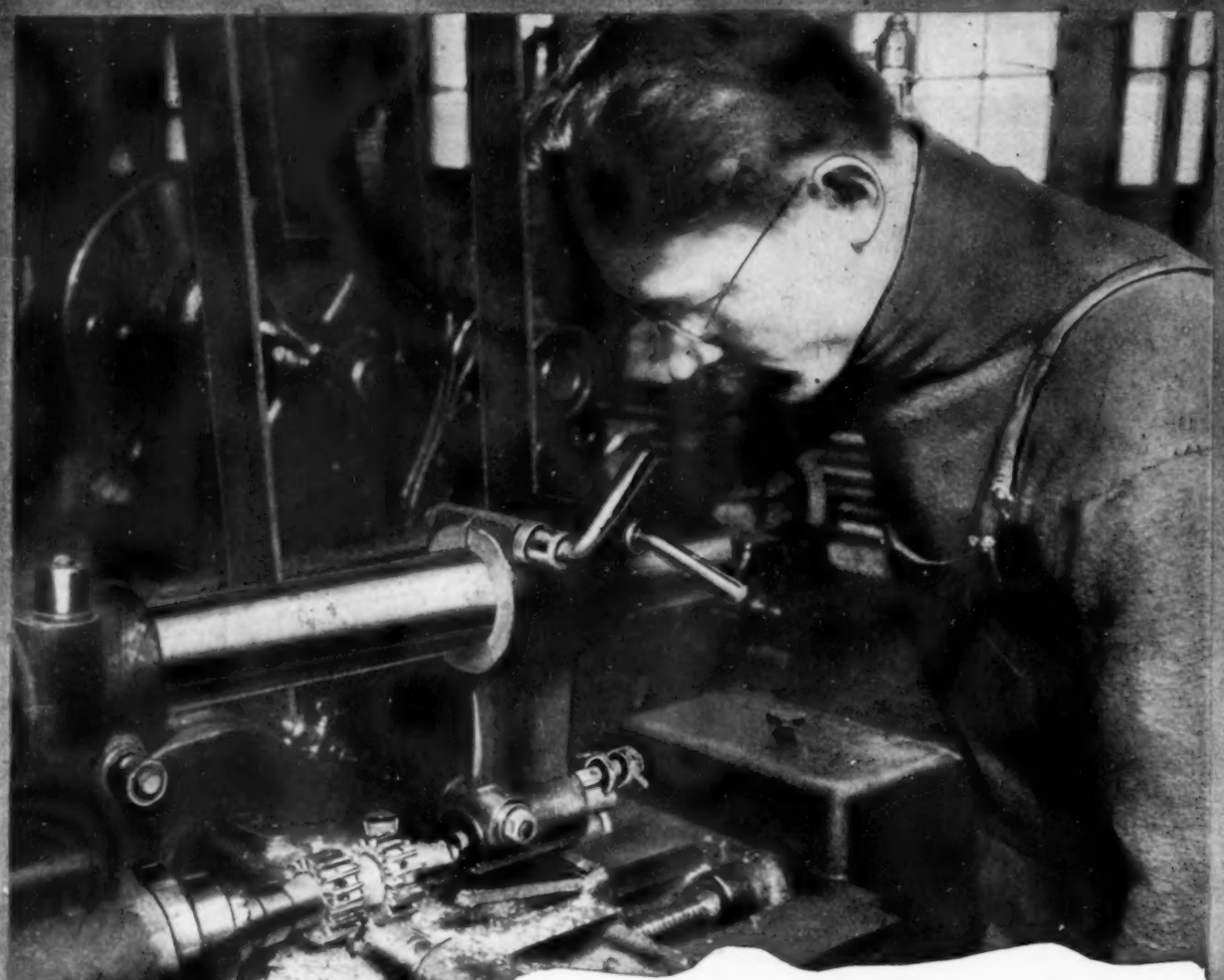
Colburn Machine Tool Co.

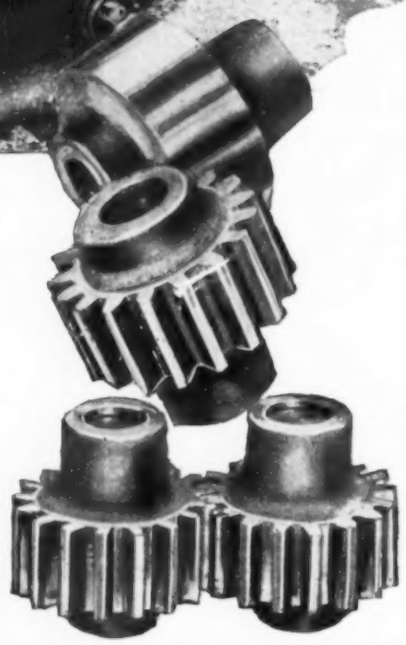
Franklin, Pa.

Builders Also of Colburn Vertical Boring and Turning Mills









10 Years Young?

THIS Cincinnati Gear Cutter is turning out 7 Hard Bronze Gears every hour. It cuts 17 teeth of diametral pitch and 1¼ face to the gear. The limits of accuracy are .001.

Not so bad for an "old timer," is it? This machine was installed in the plant of the Loew Manufacturing Co. of Cleveland, Ohio, ten years ago. "Very few repairs and still doing accurate work" is the verdict from the superintendent. A great many improvements have been made in *Cincinnati Automatic Gear Cutters* since this machine cut its first teeth—improvements that bring output to a surprisingly high point.

Let us show you what the "Modern Cincinnati" is doing.
Simply ask for Catalog.

The Cincinnati Gear Cutting Machine Co.

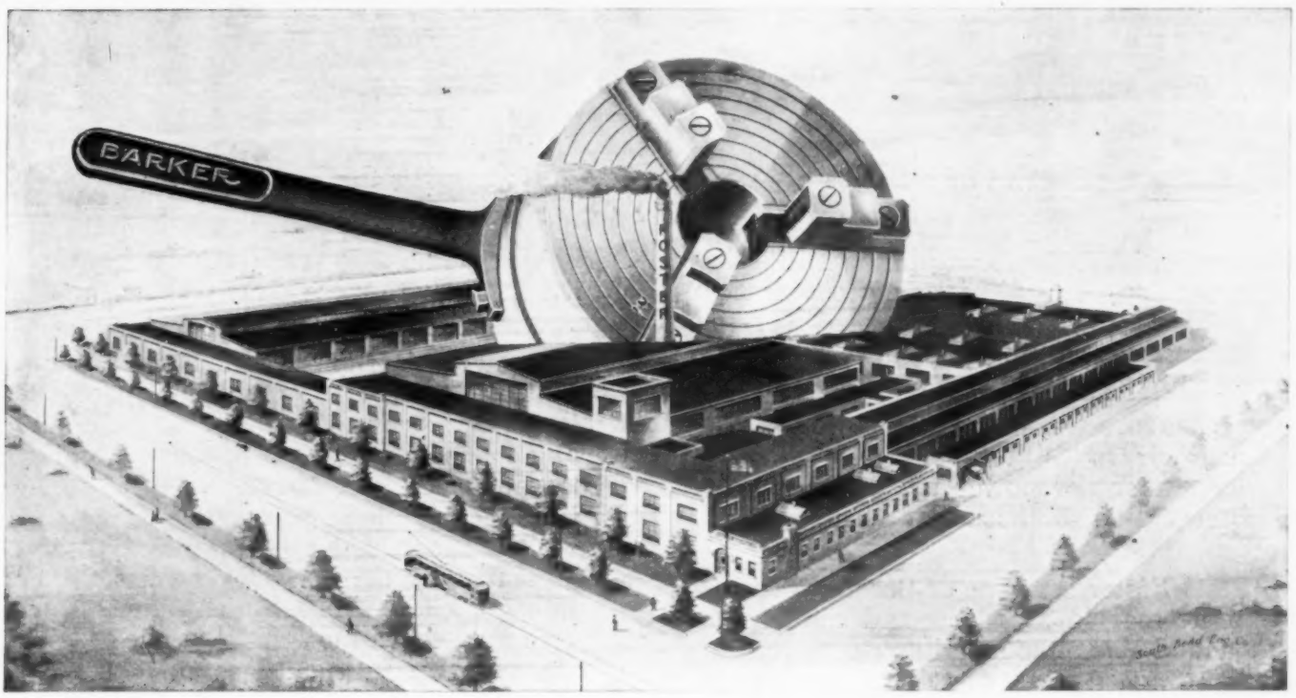
Subsidiary of The Cincinnati Shaper Co.
Cincinnati, Ohio, U. S. A.

AGENTS: Manning, Maxwell & Moore, Inc., New York City; Boston, Mass.; Buffalo, N. Y.; Chicago, Ill.; Cincinnati, Ohio; Cleveland, Ohio; Milwaukee, Wis.; New Haven, Conn.; Philadelphia, Pa.; Pittsburgh, Pa.; St. Louis, Mo.; Seattle, Wash. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. C. T. Patterson Co., Ltd., New Orleans, La. National Supply Co., Toledo, Ohio. Wolverine Machinery & Supply Co., Detroit, Mich. Herberts Machinery & Supply Co., Los Angeles and San Francisco, Calif. Chas. Churchill & Co., Ltd., London, E. C., England. Aux Forges de Vulcain, Paris, France. C. Schinz, Petrograd, Russia. Andrews & George Co., Tokyo, Japan. McPherson's Proprietary, Ltd., Melbourne and Sydney, Australia. H. W. Petrie, Ltd., Toronto, Canada. Taylor Engineering Co., Ltd., Vancouver, B. C., Canada. Williams & Wilson, Ltd., Montreal, Canada.

You Take No Risk With a

Barker Wrenchless Chuck

They are *backed up and supported* in every way by this large and fully equipped manufacturing plant. Everything that is necessary to create the best in quality, as well as the most efficient in service, is here and at your command. There is no factory more complete, no workmen more competent, and no chucks more accurately express the inventor's idea than made in this plant under his personal direction, assisted by his original and especially competent engineers and chuck experts.



Furthermore

The Chucks have actually arrived in quantity production, with an abundance of drop forgings, steel castings, and all manner of supplies in the rough, to *back up and support* the production end.

Many important sizes can be delivered from stock. All can be furnished on short delivery dates.

Write today for catalogue.

FOSTER MACHINE COMPANY, Elkhart, Ind.

CHUCK DEPARTMENT

David T. Siegel,
Suite 1377, 50 Church St.,
New York, N. Y.

R. A. Braunberger Tool & Machinery Co.,
1215 Majestic Building, Milwaukee, Wis.
549 Washington Blvd., Chicago, Ill.

Paul A. Martin—Special Representative of
The Chas. A. Strelinger Co.,
43-51 Larned St., E., Detroit, Mich.

FOSTER

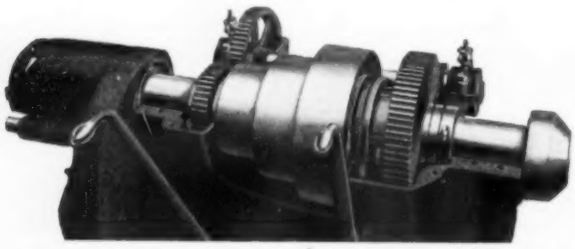
Design of Head

Second of a Series of Advertisements Describing the Foster New Line of Hand Screw Machines.

Since Fred W. Taylor made the initial discovery of high speed steel, improvement of same has followed improvement in rapid succession. The cutting steels have been made to stand higher speeds and faster feeds.

This has forced machine tool builders to redesign their machines from time to time. Larger amount of power and more rigidity has been called for because of better cutting tools.

In this Foster new line of Screw Machines an ample margin of power and rigidity has been added above the maximum requirements with a view in mind of taking care of and providing for additional improvements in cutting steels that may be brought to the front during the next few years to come. This has been done without making the machines unnecessarily heavy and without in any degree sacrificing the ease of control of operation.



The halftone shows the design of the friction head for the Nos. 3, 5 and 7 Screw Machines. The gear covers have been removed in order to more clearly show the design.

The powerful friction clutch mounted on the spindle between the cone pulley and the friction gear serves to engage the spindle into driving connection direct with the cone pulley on one side or with the back gears through the large diameter spindle gear on the other hand. The frictions are of the cone pulley type and are operated by the hand lever through the medium of a large movable sleeve and four fingers mounted on the spindle. The friction is very sensitive in operation and extremely powerful.

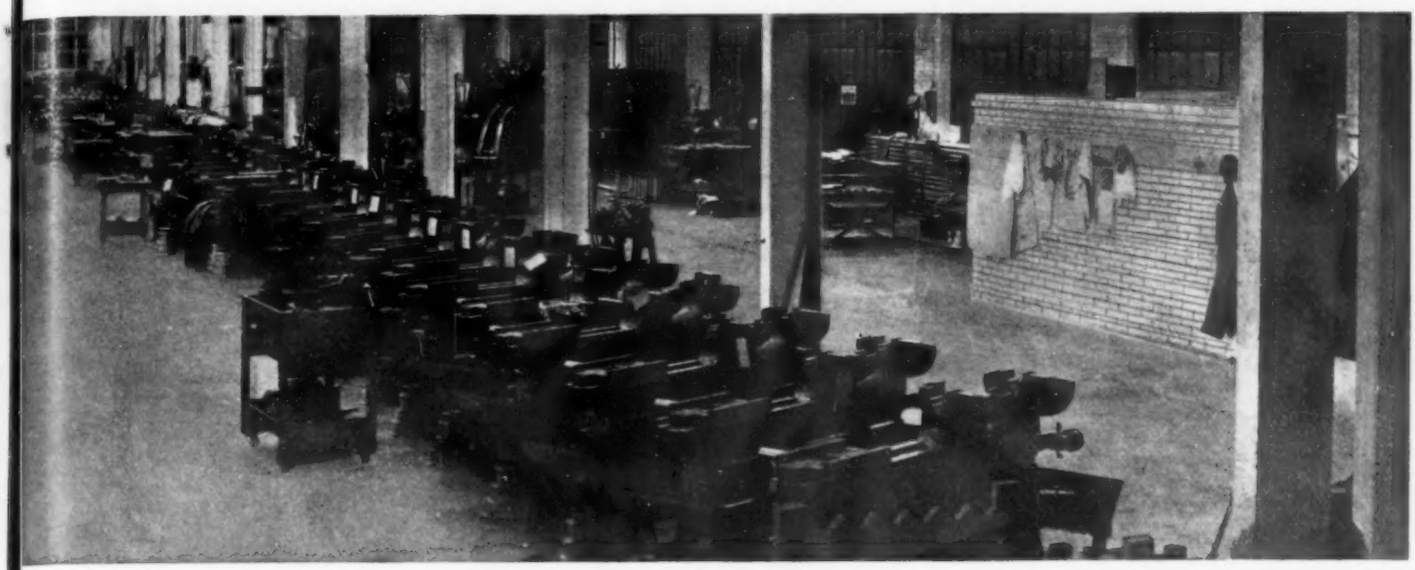
The spindle is made of a high carbon steel forging and is journalled in liberally proportioned bearings made of a special high grade bronze.

The head is cast intregal with the bed. The rigid double girder type of bed is very heavily ribbed internally and is designed throughout to gain the maximum rigidity without the use of an unnecessary large amount of cast iron.

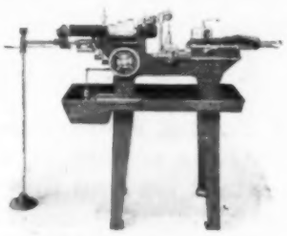
We have ready for instant distribution circulars of each size of Screw Machines. These circulars also describe our excellent and comprehensive new line of Screw Machines tools for each size of machine.

Write for these circulars.

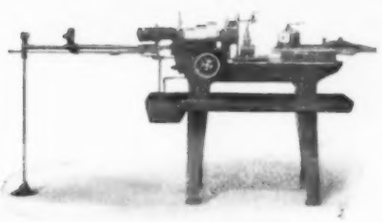
FOSTER MACHINE COMPANY,



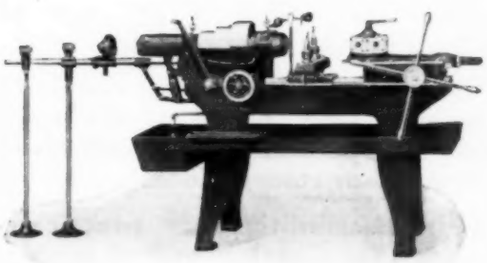
FOSTER



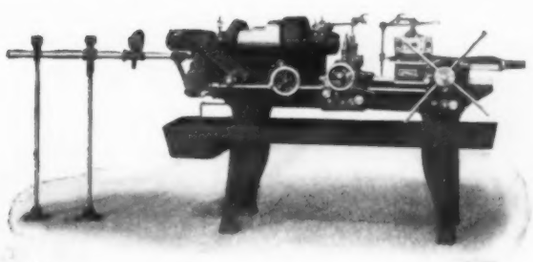
No. O P.H. Screw Machine



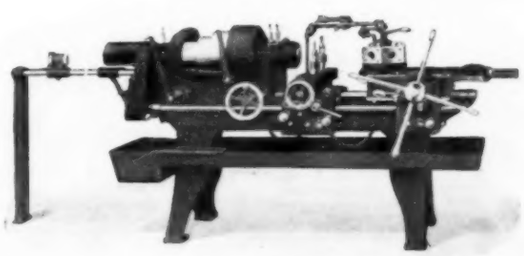
No. 1 P.H. Screw Machine



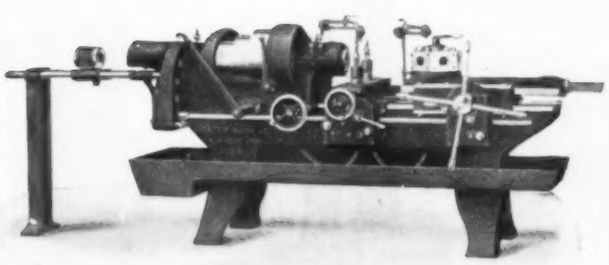
No. 3 P.H. Screw Machine



No. 3 F.H. Screw Machine



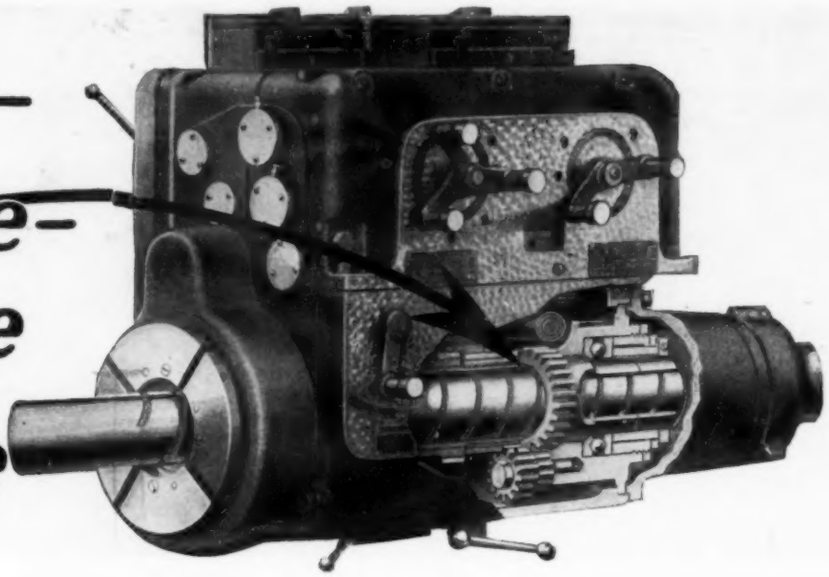
No. 5 F.H. Screw Machine



No. 7 F.H. Screw Machine

ELKHART, IND., U. S. A.

Positive-Sensitive-to the Extreme



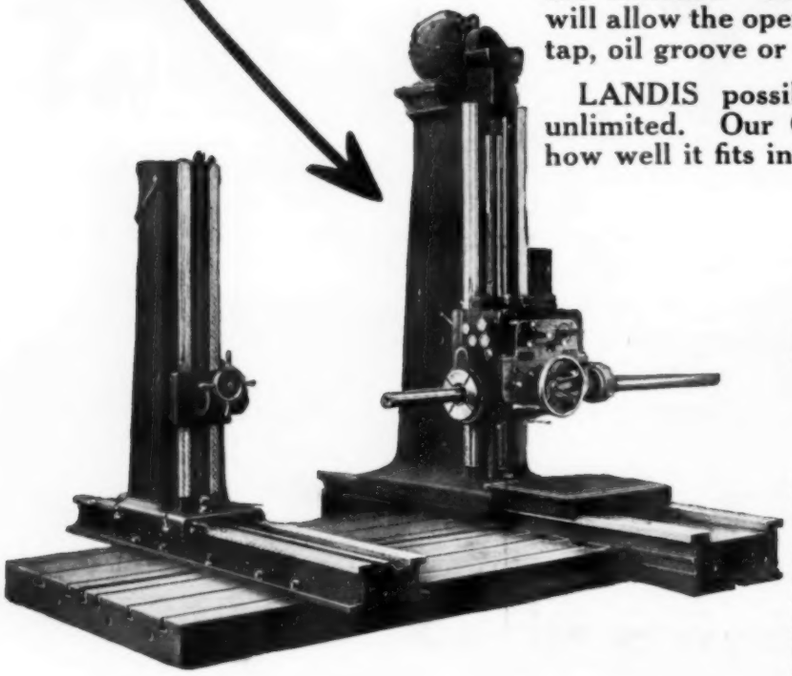
The Concentric Screw Feed

of the LANDIS Boring, Milling and Drilling Machine exerts an unvarying thrust, a smooth and constant feed on the spindle. The illustration shows the operation of the feed nut. This nut, of bronze, engages a square thread on the spindle. Twelve speeds are provided, all obtained by advancing or retarding the rotation of the spindle nut. This is but *one* of LANDIS exclusive features.

LANDIS

LANDIS control is easy and simple to the extreme. One setting of the work will allow the operator to bore, mill, drill, tap, oil groove or rotary plane.

LANDIS possibilities are practically unlimited. Our Catalog will show you how well it fits in your work.



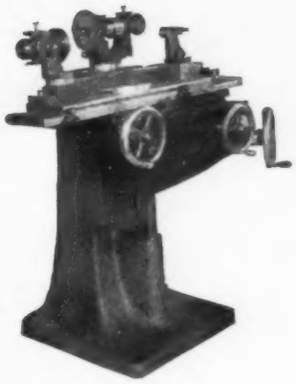
Landis Tool Co.

Waynesboro, Pa.

New York Office, 50 Church St.

DOMESTIC AGENTS: Dewstoe Machine Tool Co., Birmingham; Elliott & Stephens Machinery Co., St. Louis; F. C. Richmond Machinery Co., Salt Lake City; Hallidie Machinery Company, Seattle; Harron, Rickard & McCone, San Francisco and Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Seeger Machine Tool Co., Atlanta; Sheehan-North Co., El Paso. CANADIAN AGENTS: A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal. FOREIGN AGENTS: Allied Machinery Co., Paris, Turin, Barcelona, Brussels, Zurich and Lisbon; Andersen, Meyer & Co., Ltd., Shanghai; Andrews & George Co., Ltd., Tokyo; Benson Brothers, Sydney and Melbourne; Burton, Griffiths & Co., Ltd., London; R. S. Stokvis & Zonen, Rotterdam; Wilh. Sonesson & Co., Malmo and Copenhagen.

Detroit Uses THE "OHIO" GRINDER



Within the past few years the following concerns have added "Ohio" Grinders to their equipment. The highest number of machines in one plant is 30. Several have more than 10 Ohio Grinders.

Arthur Colton Co.
Blodget Eng. Co.
Chevrolet Motor Co.
Champion Ignition Co.
Cadillac Motor Car Co.
Canadian Products, Ltd.
Dort Motor Co.
Detroit Twist Drill Co.
Ford Motor Co.
Goddard & Goddard Co.
Great Lakes Eng. Wks.
General Aluminum & Brass Mfg. Co.
Hayes Mfg. Company
Henry Ford & Son, Inc.
Harroun Motors Co.
Kelsey Wheel Co.
King Motor Works
Long Mfg. Co.
Mailometer Co.
Maxwell Motor Co.
McCord Mfg. Co.
National Twist Drill Co.
Olds Motor Works
Oakland Motor Co.
R. W. Runde Mch. & Die Works

Our users file shows every Automobile Manufacturer in Detroit and vicinity. Detroit knows—

Production, the Value of Properly Ground Cutters and the Ohio Grinder.

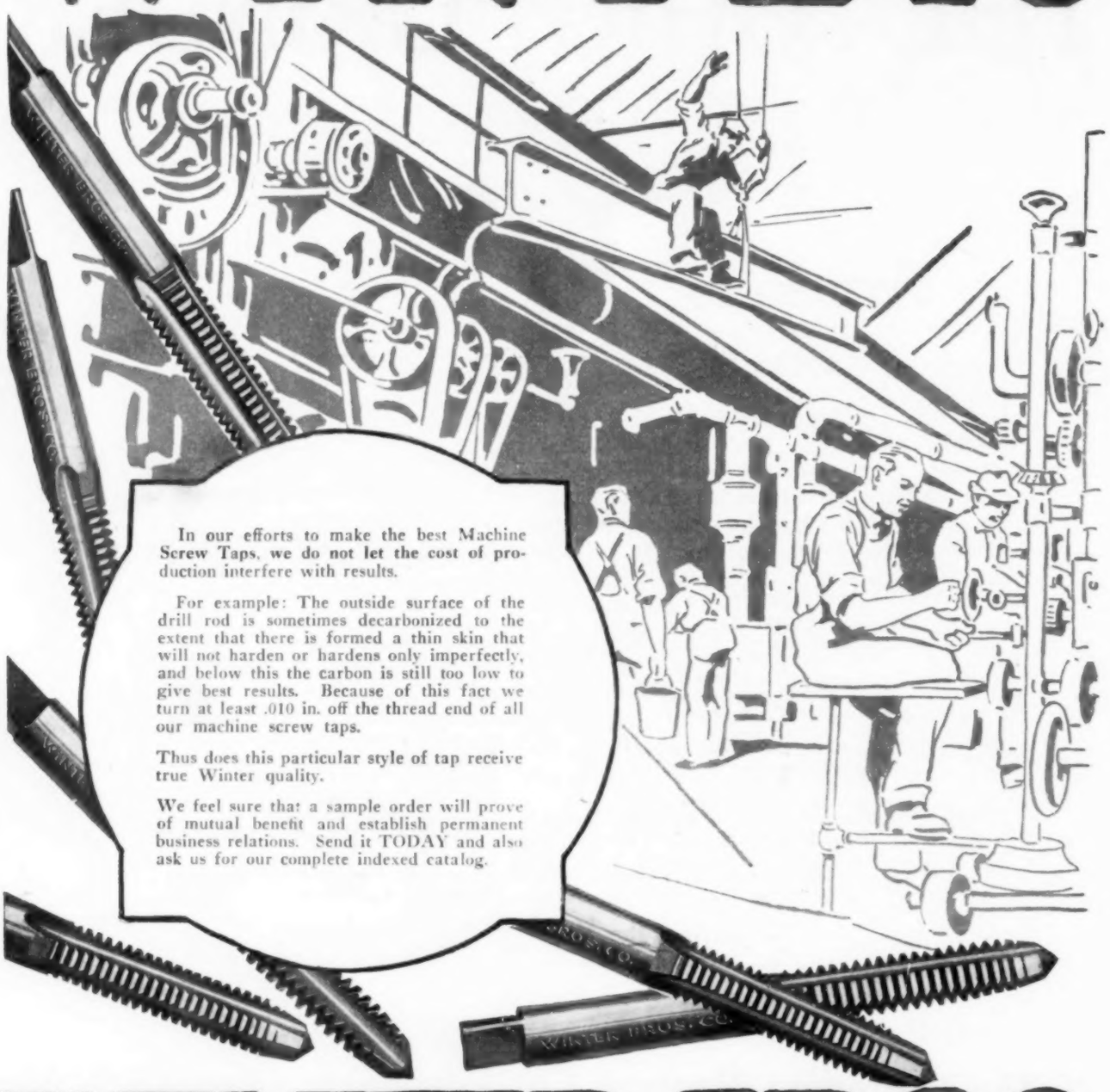
Do You?

The Oesterlein Machine Co., Cincinnati, Ohio, U. S. A.

MILLERS **OHIO** GRINDERS

Tilted Rotary

depending on WINTER



In our efforts to make the best Machine Screw Taps, we do not let the cost of production interfere with results.

For example: The outside surface of the drill rod is sometimes decarbonized to the extent that there is formed a thin skin that will not harden or hardens only imperfectly, and below this the carbon is still too low to give best results. Because of this fact we turn at least .010 in. off the thread end of all our machine screw taps.

Thus does this particular style of tap receive true Winter quality.

We feel sure that a sample order will prove of mutual benefit and establish permanent business relations. Send it TODAY and also ask us for our complete indexed catalog.

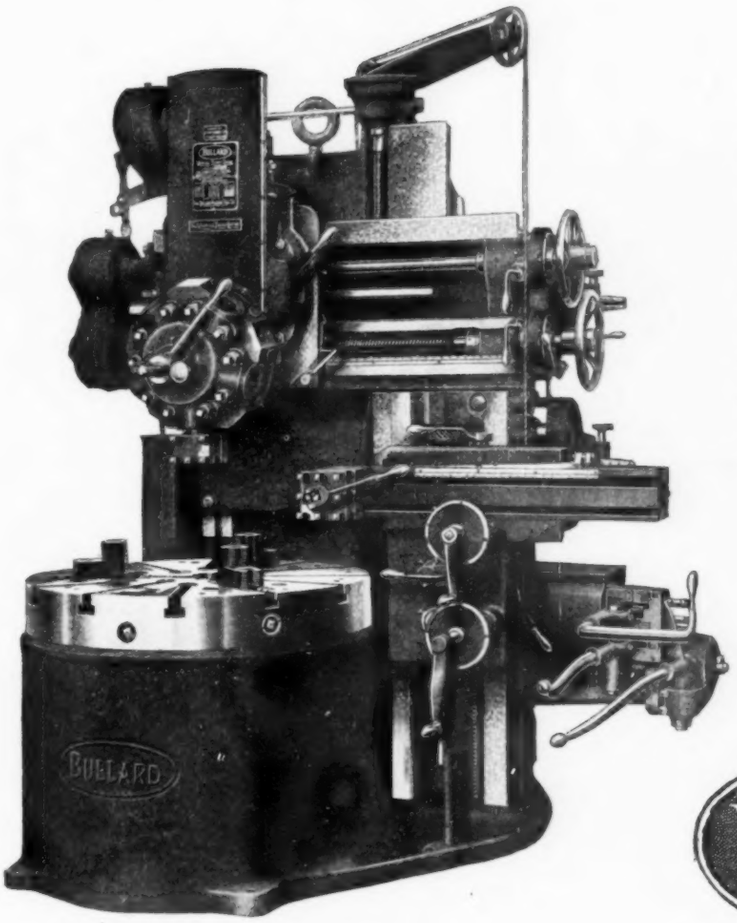
WINTER BROS.

For Quality Taps and Dies

Wrentham Mass. U.S.A.

They Reduce Costs

"We are going to use this fact in our advertising within a short time"



A large Western concern has notified us they will advertise that a battery of Bullard Vertical Turret Lathes enables them to reduce costs on their large gear blanks.

"Besides using these lathes on this particular work," their letter continues, "we used them"—let the following pages illustrate and describe the number of jobs they used them on. The experience of this concern demonstrates that one of the big reasons for Vertical Turret Lathe economy lies in its versatility—the ease with which it can be turned from job to job.

VERTICAL TURRET LATHE

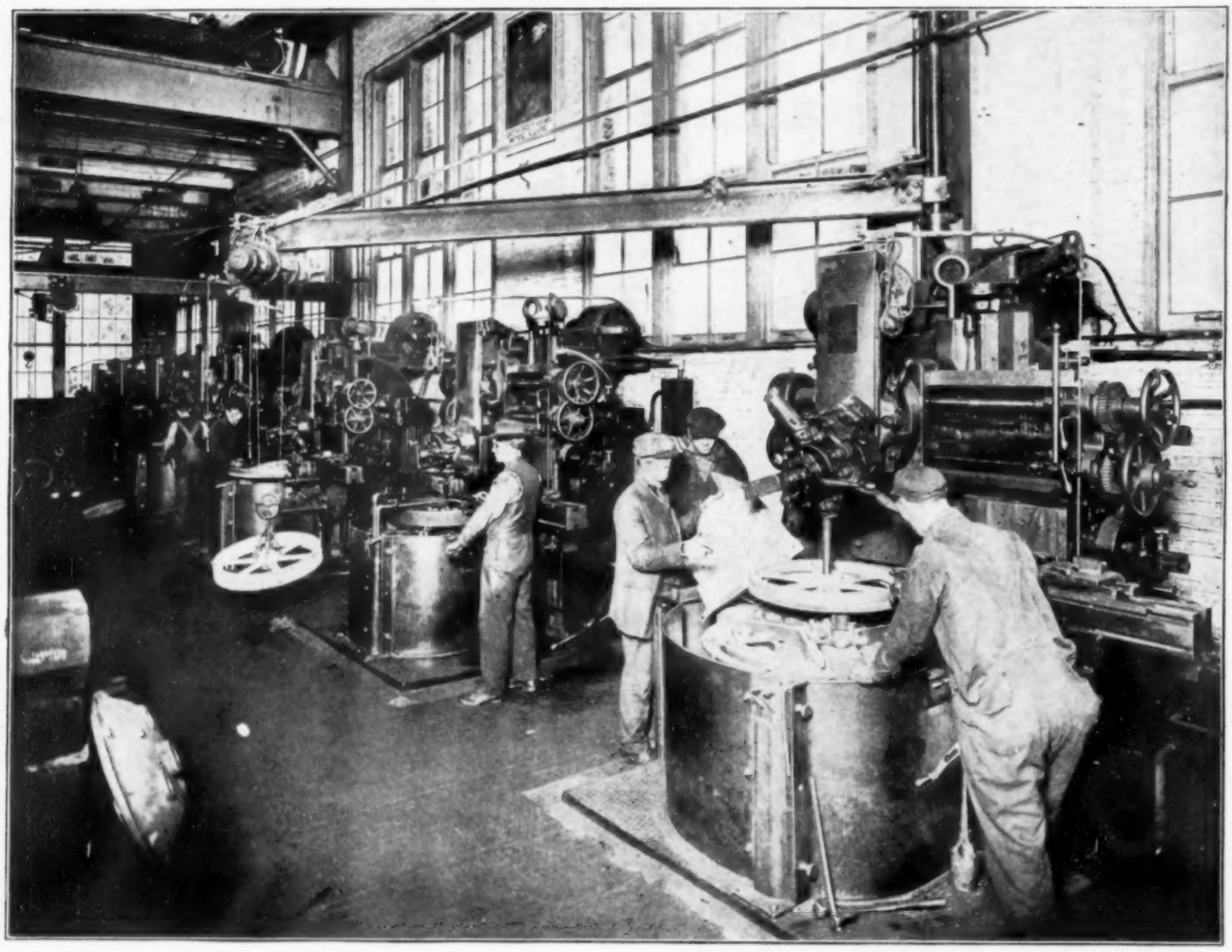
The Bullard Machine Tool Company

Bridgeport, Connecticut, U. S. A.

Also Builders of the Mult-Au-Matic and the Maxi-Mill

BULLARD

This Shop Bullardized Result—Large Range of Work



Cutting Cost on Large Gear Blanks, and Then–

Here is the paragraph from the letter referred to on the preceding page:

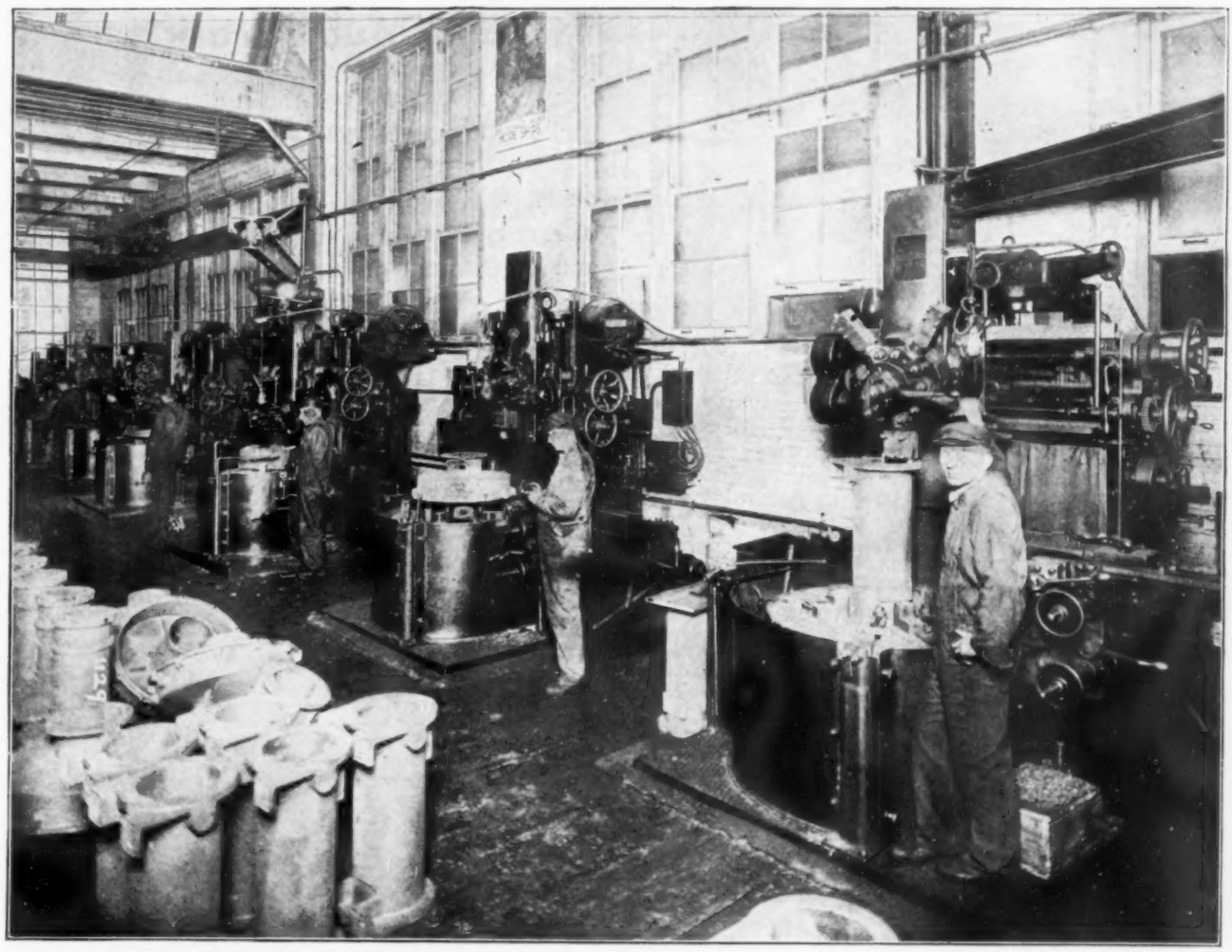
"Beside using these lathes on this particular work (Gear Blanks), we used them for a large range of work such as carbonizers for bottle fillers, fresh water stills for the Emergency Fleet, cores for tire vulcanizers and a number of other purposes for which boring mills are not usually used, including die blocks. We have found it cheaper to face and square these on the Bullard lathes than to plane them. During the war we used them to make flywheels for Liberty Motors on Government contract."

The Bullard Machine Tool Company

Also Builders of the Mult-

BULLARD

Its Production Handled on Same Machines



—on Carbonizers, Water Stills, Cores, Flywheels, etc.

The pictures on these pages accompanied the letter.

Wherever you find Bullardized Production there you will find also a grateful user. Ask us how you can Bullardize your production—to Bullardize is to secure higher production at lower costs.

Because the concern, as we have explained, intends to use this material in forthcoming advertising, we have refrained from using their name. Watch for their advertising or, if you so desire, we will send you the name.

Bridgeport, Connecticut, U. S. A.

Au-Matic and the Maxi-Mill

BULLARD

This Will Help You See Why the

The Tool-Carrying Side Head Enables the Operator to do Twice as Much Work

because it permits simultaneous cutting—multi-cutting—on various surfaces. Examples are shown on the opposite page. Obviously, it is a big factor in reducing the cost of face plate work. The universal movement and adjustment of both main and side head adapts the machine to a decidedly wide range of work with the use of standard tools.

Its versatility does not keep the foreman on the jump looking for the right job—it's as ready for the single piece as for the small lot or for the constant stream of production, and will save money on all. It can be quickly set up; its vertical construction minimizes the time required in changing from one job to another.

VERTICAL TURRET LATHE

Other Advantages

Chrome Nickel Gears
Continuous Lubrication
Vertical Construction
Centralized Control
Power Operated Parts
Excess Power and Rigidity
Quick Acting Brake
Observation Stops

Do Not Neglect Investigating Bullardized Production

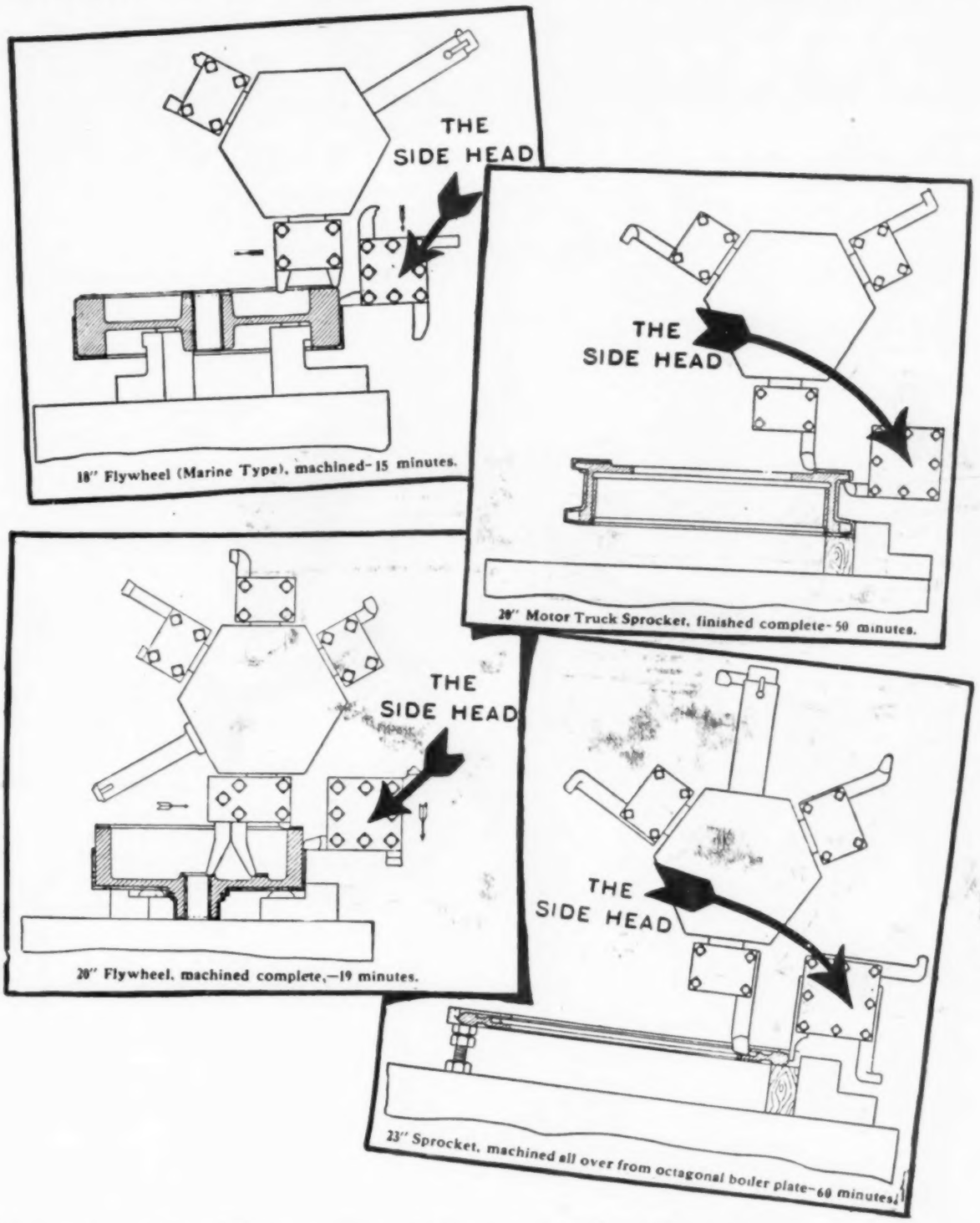
Bullardized Production is greatest return per dollar invested. Have us show you how the Vertical Turret Lathe measures up to that standard. Bullard Engineering Service is ready to consult with you. "CUTTING TIME BETWEEN CUTS" is a book full of information about production on the Bullard Vertical Turret Lathe, showing actual set-ups and operations. Write now for a copy.

The Bullard Machine Tool Company

Also Builders of the Mult-

BULLARD

Versatile Vertical Turret Lathe Cuts Costs


THE SIDE HEAD
18" Flywheel (Marine Type), machined—15 minutes.
THE SIDE HEAD
28" Motor Truck Sprocket, finished complete—50 minutes.
THE SIDE HEAD
20" Flywheel, machined complete,—19 minutes.
THE SIDE HEAD
23" Sprocket, machined all over from octagonal boiler plate—60 minutes.

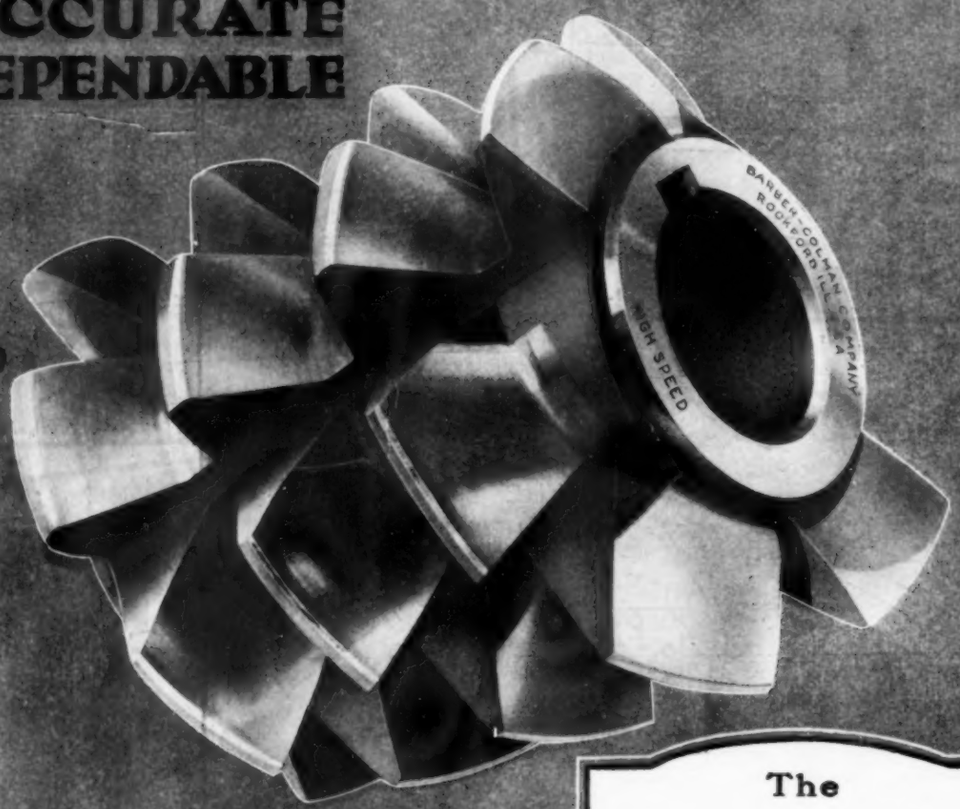
Bridgeport, Connecticut, U. S. A.

Au-Matic and the Maxi-Mill

BULLARD

BARBER-COLMAN
GROUND HOBS

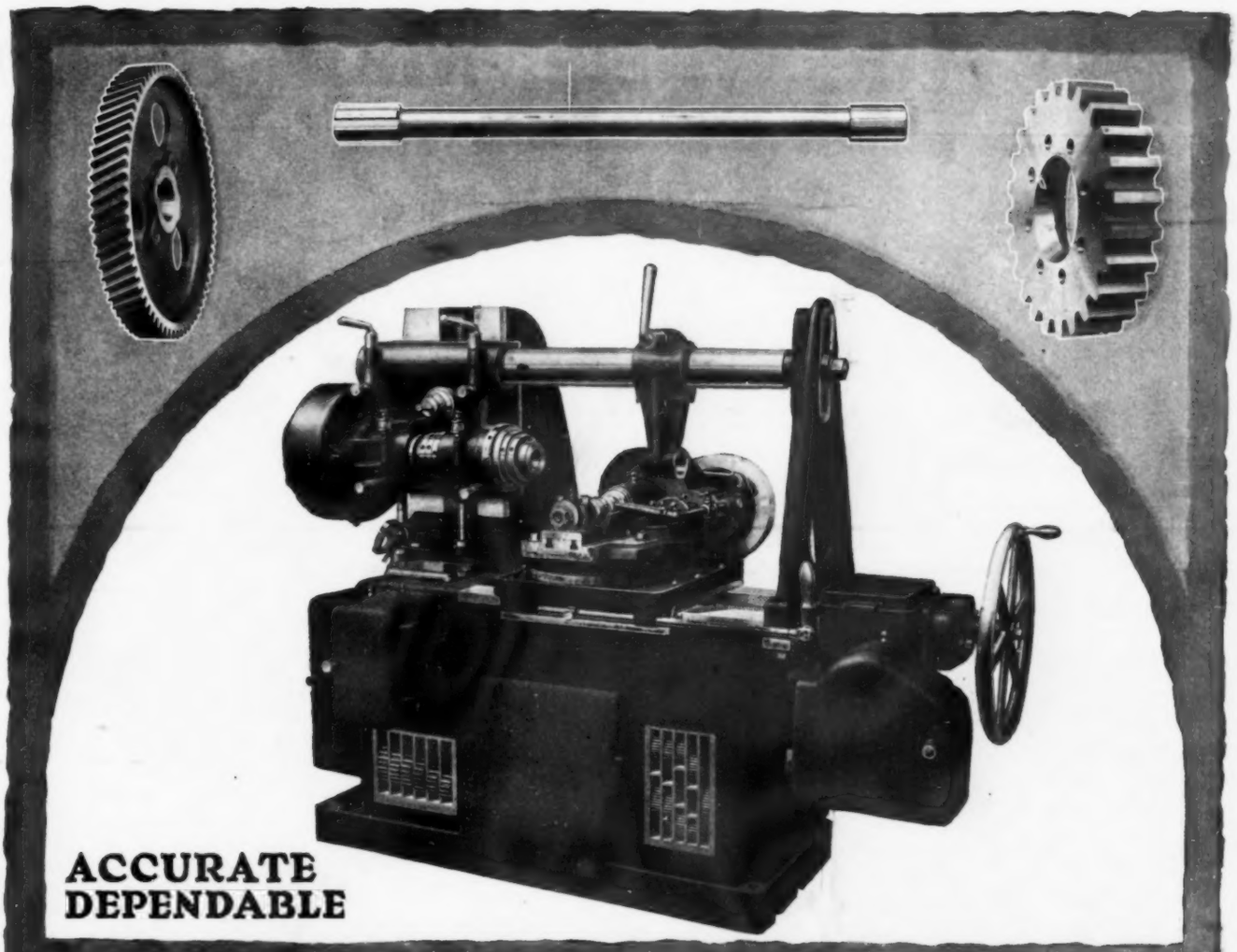
ACCURATE
DEPENDABLE



B-C HOBS WILL BE YOUR HOBBY

The
Best Results
In Cutting
Worm Gears
Are Obtained With
Ground Hobs

BARBER-COLMAN COMPANY
ROCKFORD, ILL. U.S.A.



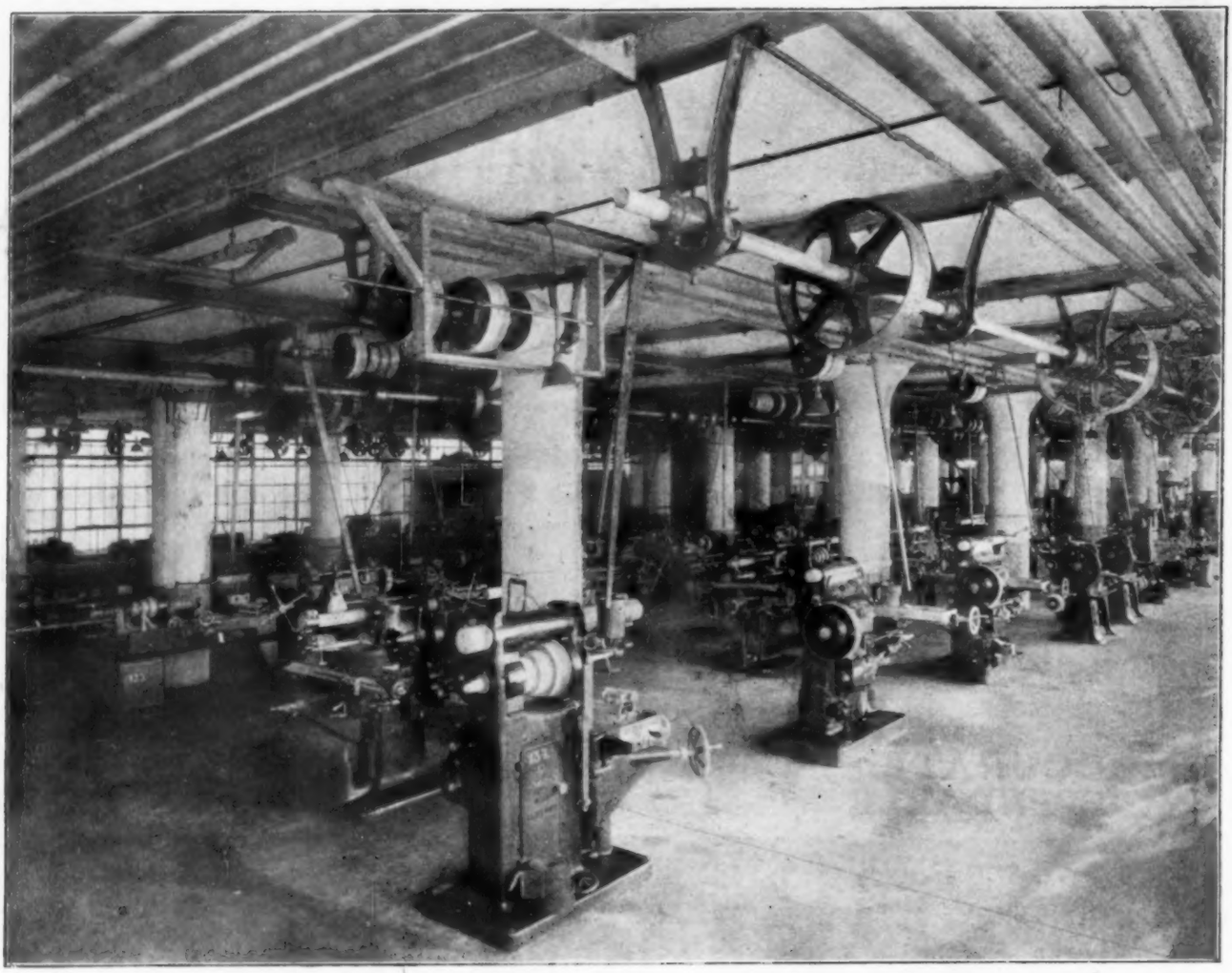
BARBER-COLMAN
HOBBING MACHINES

are unexcelled, producing in continuous operation, accurate quiet running gears.

Spline Shafts of the highest degree of accuracy are also generated on our machine at maximum production.

BARBER-COLMAN COMPANY
ROCKFORD, ILL., U.S.A.

Says the Wise Man to His



Hyatt Roller Bearing Hangers are Standard Transmission Equipment in Modern Plant Construction

HYATT ROLLER BEARING COMPANY
INDUSTRIAL BEARINGS DIVISION
METROPOLITAN TOWER, NEW YORK

Manufacturers of Bearings for Mine Cars, Ore Cars, Steel Mill Cars, Roller Tables, Trolleys, Cranes, Hoists, Machine Tools, Shafts, Countershafts, Concrete Machinery, Textile Machinery, Conveyors, Lift Trucks, Industrial Trucks, Railway Service Cars, Storage Battery Locomotives, etc.

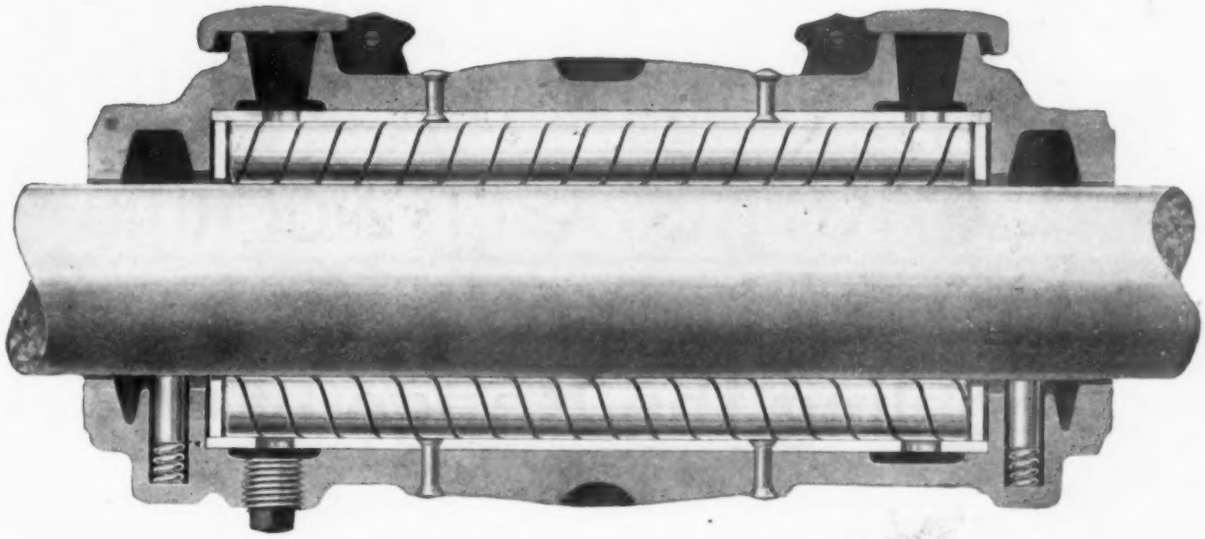
Motor Bearings Division
Detroit, Mich.

Tractor Bearings Division
Chicago, Ill.

B-182

HYATT BEARINGS

Machines, "More Power to You"



The far sighted man who says "more power to you" to his machines and gives them more power gets his reward in greater production—$300 greater per year for each horse power.

The thing most needed if you are to get greater production is more power. More power delivered to the machines.

You can get more power by:

1. Increasing your power plant—expensive.
2. More economical distribution of your present power—effective.

Every horse power that you can save by economical distribution of your power will produce $300 worth of iron and steel products every year.

It is therefore worth money—real money to you to give careful consideration to a sure means of saving power.

Hyatt Roller Bearing Hangers will save *at least* 15 per cent. of your total power. Which means that the use of Hyatt Roller Bearing Hangers on your line shaft will make possible an increase of *at least* 15 per cent. of your total production (salable goods) without the use of an extra shovel of coal or an extra pound of water.

Can you afford to put off installing Hyatt Roller Bearing Hangers? Send for complete engineering data.

FOR LINE SHAFTS

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

Doubling the Range of Work

Courtesy of Foote-Burt Co., Cleveland, Ohio.

The No. 15½ Foote-Burt machine must drill holes ranging from ⅜ in. to 2 in. in diameter on the same piece, and must turn out work with all possible dispatch. The situation calls for a flexible drive, with convenient control of spindle speed for the widely varying cuts, and absolute dependability under continuous service. A Johnson double clutch in the back gearing answers the call.

The Johnson Friction Clutch

For machine tool work, where each installation brings up a new problem, Johnson clutches stand alone. Experienced designing enables us to settle each case on its individual needs; faithful building insures that it will be settled permanently. When you plan a new machine, let us figure on Johnson clutches for every control. We will be pleased to work out the details.

Double Clutch—Exterior

Get our Blue Catalogue

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

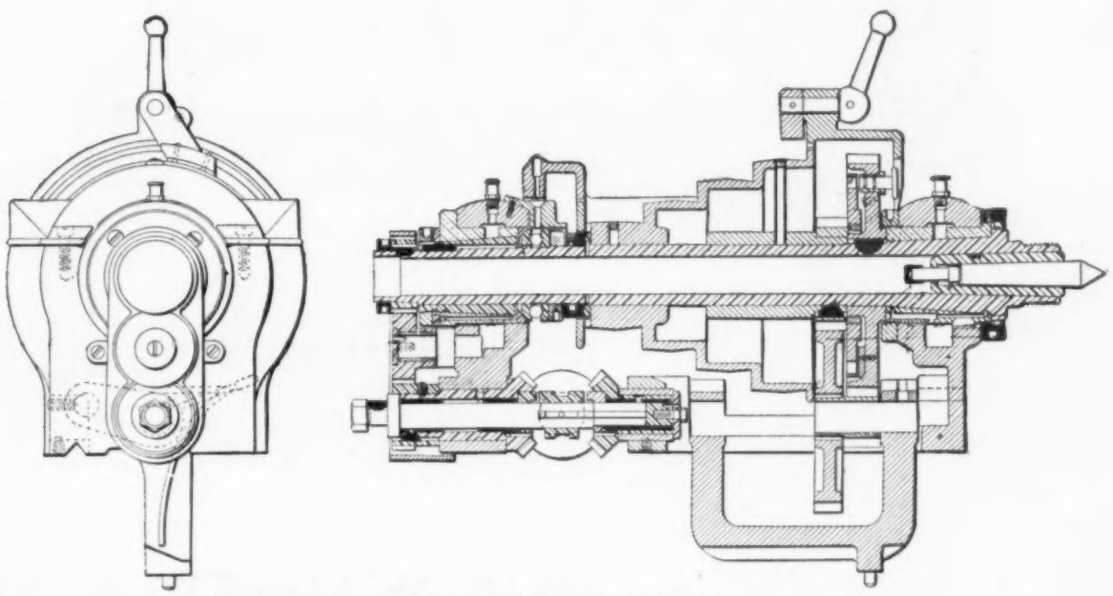
FOREIGN AGENTS:

Canada: Williams & Wilson, 84 Inspector St., Montreal. The Canadian Fairbanks-Morse Co., Ltd., Montreal and branches.
England: The Efandem Co., 22 Newman St., Oxford St., London, W. 1. Sole Agents for British Isles
France: Anciens Etab. Glaenzer & Perreaud, 18 Faubourg du Temple, Paris.
India: J. D. Jones & Co., Bombay and Calcutta.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.
Japan: Andrews & George Co., 16 Takegawa-cho, Kiobashiku, Tokyo.
South Africa: D. Drury & Co., Main St., Johannesburg.
Oscar C. M. Knudsen, Christiania, Norway.
Scandinavia: Wilhelm Sonesson & Co., Copenhagen, Denmark and Malmo, Sweden.

Close Coupled

Below are cuts which will show you why we call our lathe the "Close Coupled." Note the absence of Back Gears. They are placed under the headstock at the front end of the spindle. This arrangement applies the drive from the cone through the gears without the long eccentric shaft and quill universally used on cone driven lathes. The back gears are brought into mesh by a handle placed at the front of the lathe making it unnecessary for the operator to reach over the cone.

Note the well balanced construction of this lathe, the back of the headstock is the same as the front, and all bearings are centralized eliminating all Torsional Strain.



DETAILS OF HEAD, SHOWING POSITION OF BACK GEARS

Davis Machine Tool Co., Inc.

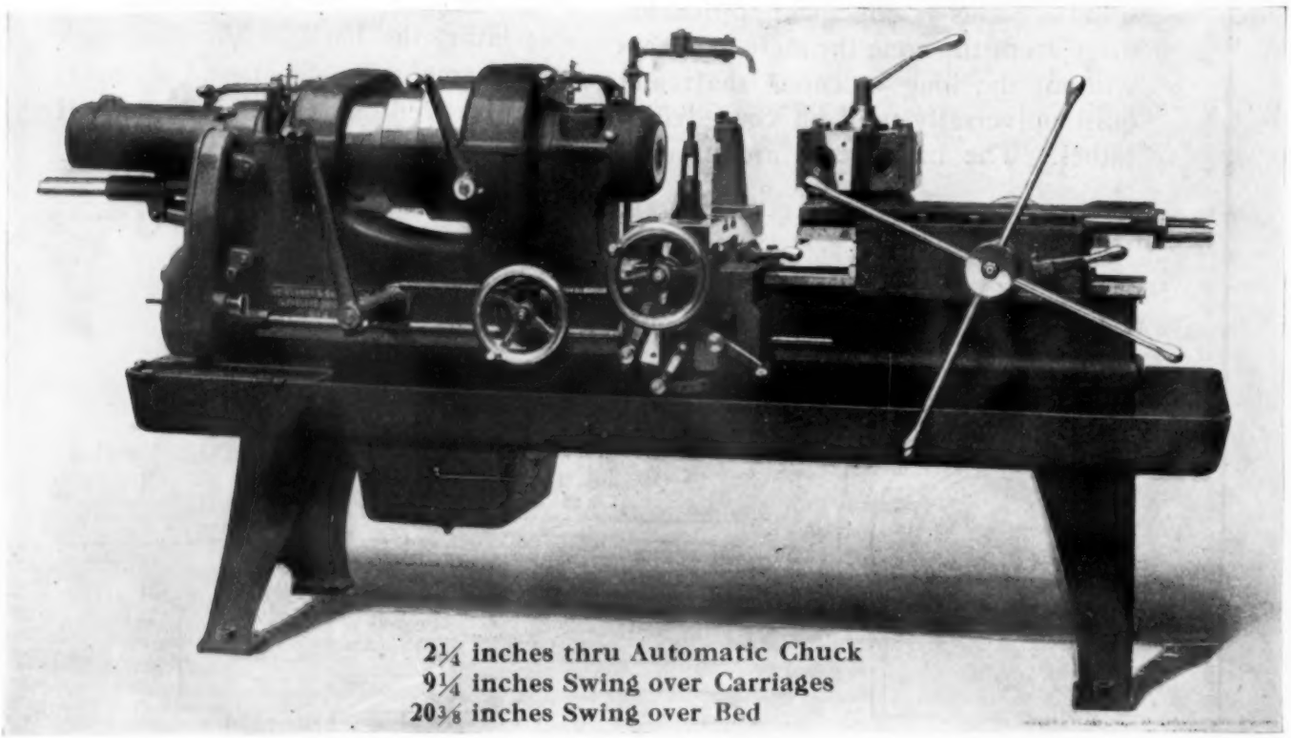
Rochester, N. Y., U. S. A.

Here is the New W & S No. 6

Stronger, with more power and greater speed range. Its double-friction back gears almost double the power transmitted by the single back-geared machines, and provide three spindle speeds for each shift of the belt.

The heavy duty carriage with six power cross feeds, together with the double-friction back gears, make possible greater production on the No. 6 Turret Lathe than on any other machine of its size.

Write for details



2¼ inches thru Automatic Chuck
9¼ inches Swing over Carriages
20⅜ inches Swing over Bed

No. 6 Turret Lathe

THE WARNER & SWASEY

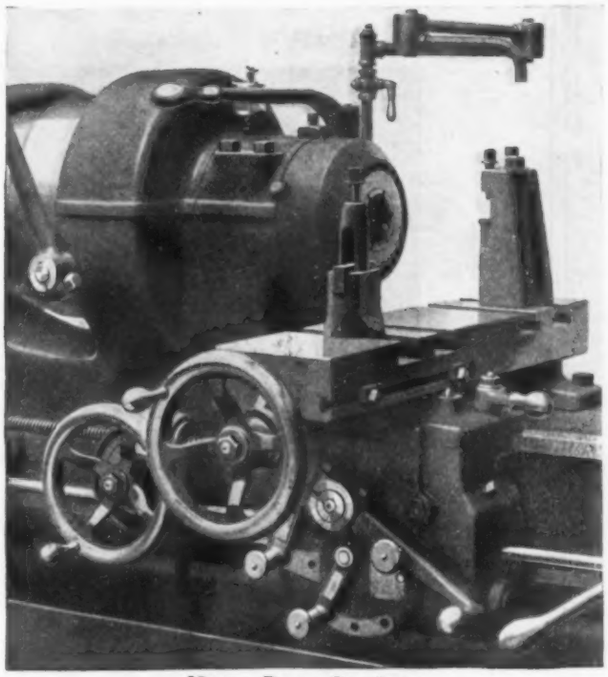
Branch Sales Offices : **BOSTON : Oliver Building** **NEW YORK : Singer Building**

DOMESTIC AGENTS:
Fulton Supply Company, Atlanta, Ga.
Young & Vann Supply Company, Birmingham, Ala.
Woodward, Wight & Company, New Orleans, La.
Salt Lake Hardware Company, Salt Lake City, Utah.
Smith-Booth-Usher Company, Los Angeles, Calif.
Fred Ward & Son, San Francisco, Calif.
Portland Machinery Company, Portland, Ore.
Hallidie Machinery Company, Seattle, Wash.

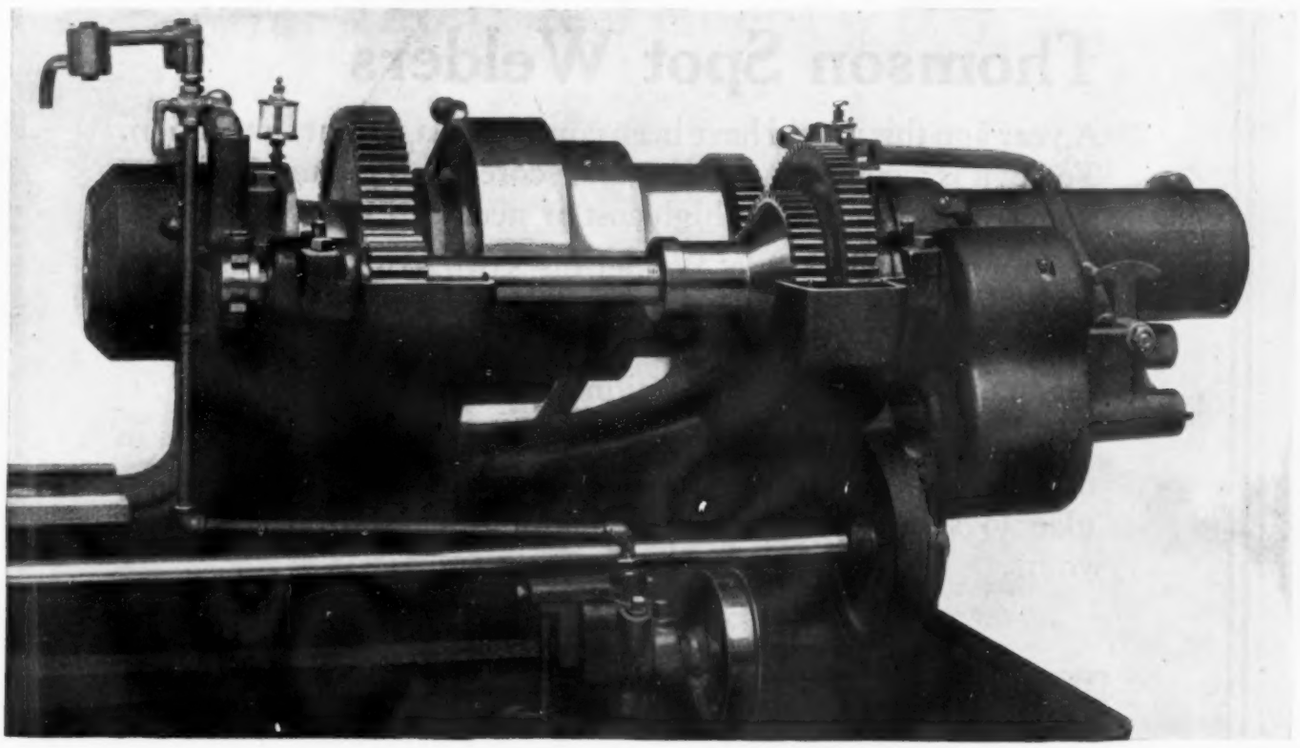
CANADIAN AGENTS:
A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, Vancouver and St. John's.
Williams & Wilson, Ltd., Montreal.

Turret Lathe

In addition to greater output, the No. 6 Turret Lathe will finish parts in its size range which require strength and excess power just as well as the heavier and more expensive machines. The No. 6 Turret Lathe, therefore, finishes at lower cost gear blanks, forgings and tough alloy steel parts.



Heavy Duty Carriage



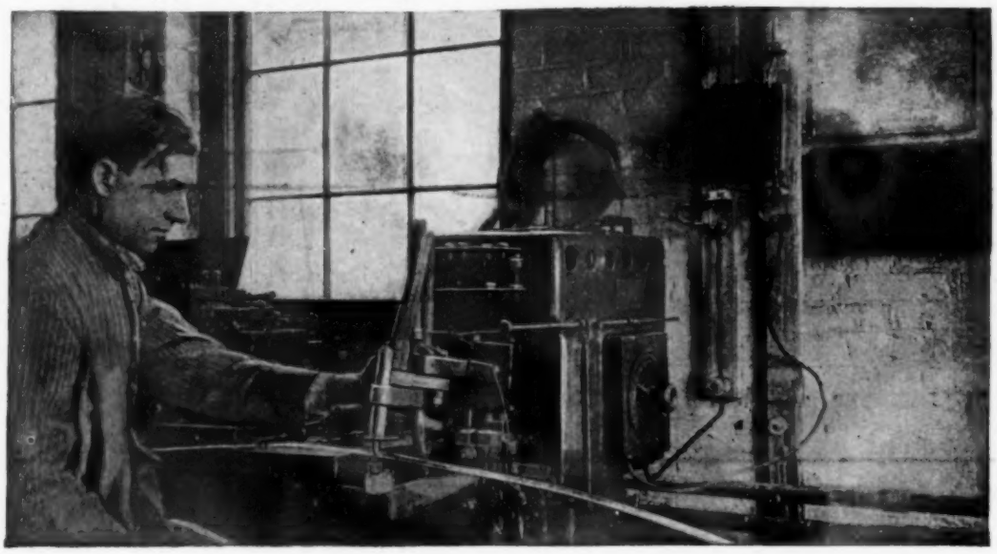
Double Friction Back Gears

COMPANY, Cleveland, Ohio

BUFFALO: Iroquois Building **Detroit: Ford Building** **CHICAGO: 618-622 Washington Boulevard**

FOREIGN AGENTS:

Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Sonesson Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stokvis en Zonen, Rotterdam.
Benson Bros., Sydney, Melbourne, Adelaide.
Yamatake & Company, Tokio.
McLeod & Company, Calcutta.
Anderson, Meyer & Company, Ltd., Shanghai, Tiensin, Pekin, Hankow, Canton, Yumanfu, Changhau, Kalgan.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.



Salvaging Scrap Steel with Thomson Spot Welders

A year ago this would have been considered a unique innovation. Today it is a common practice and scores of companies are putting a big crimp into the high cost of steel.

In four seconds this Spot Welder fuses two strips of old and new steel into one piece. The current consumption is only .0027 K.W. Hours. No punching or riveting—but simply the placing of the two pieces into position and applying the current.

The biggest field for Thomson Spot Welding, however, is in manufacturing. We have much interesting data and will be glad to show you what the Thomson will do on work like yours.

Thomson Process
Electric Welding

Send us samples or blueprints, or ask for bulletin SA-1.

THOMSON SPOT WELDER CO.

LYNN, MASS., U. S. A.

Buffalo	595 Ellicott Square Building	Detroit	1133 Majestic Bldg.
Chicago	817 W. Washington Blvd.	Duluth	Northern Machinery Company
Cincinnati	Knowlton & Langland Streets	Grand Rapids	McMullen Machinery Co.

19 Years on the Job and Still Good for 1500 Steel Hoops a Day

Welding by the Thomson Process is not a temporary sort of thing. When a "Thomson" is put into a shop it goes there on the basis of producing from *every* standpoint—and that includes the ability to stand up.

This 19-year old Butt Welder is handling hoops 12-in. in diamter, 1½ in. wide, 1/16 in. thick at the rate of 1500 a day, with a current consumption of only .002 K.W. Hours per weld, which costs about 15 cents per day.

Joining the ends of most all kinds of metal is within the Thomson range. Let us show you just what you may expect on *your* work. *Send us samples or blueprints.*

Bulletin B-A-1 describes similar models of more modern design but of the same quality as this welder.

Thomson Process
Electric Welding

THOMSON ELECTRIC WELDING CO.

LYNN, MASS., U. S. A.

Kansas City	English Tool & Supply Co.	Philadelphia	1211 Widener Bldg.
Lynn	161 Pleasant Street	Pittsburgh	3 Wood St.
Minneapolis	Northern Machinery Company	San Francisco	Charles A. Dowd Sales Company
New York	1604 U. S. Express Building	St. Louis	208 Security Building

25% to 75% Less Labor

We have testimonials from many plants all over the country and 9 out of every 10 of them read to the effect that Federal Butt Welding outfits reduce labor costs from 25 to 75 per cent.

Federal Butt Welders

Are designed and constructed with a complete knowledge of what will be expected of them by users. Long years of experience have enabled us to know what constitutes a correct welding outfit with the result that we can absolutely guarantee our product.

The Federal Machine and Welder Company manufacture all types of butt and spot welding outfits. Special types for special work can be quickly designed and built.

What is it that you need in this line? Estimates will gladly be given.

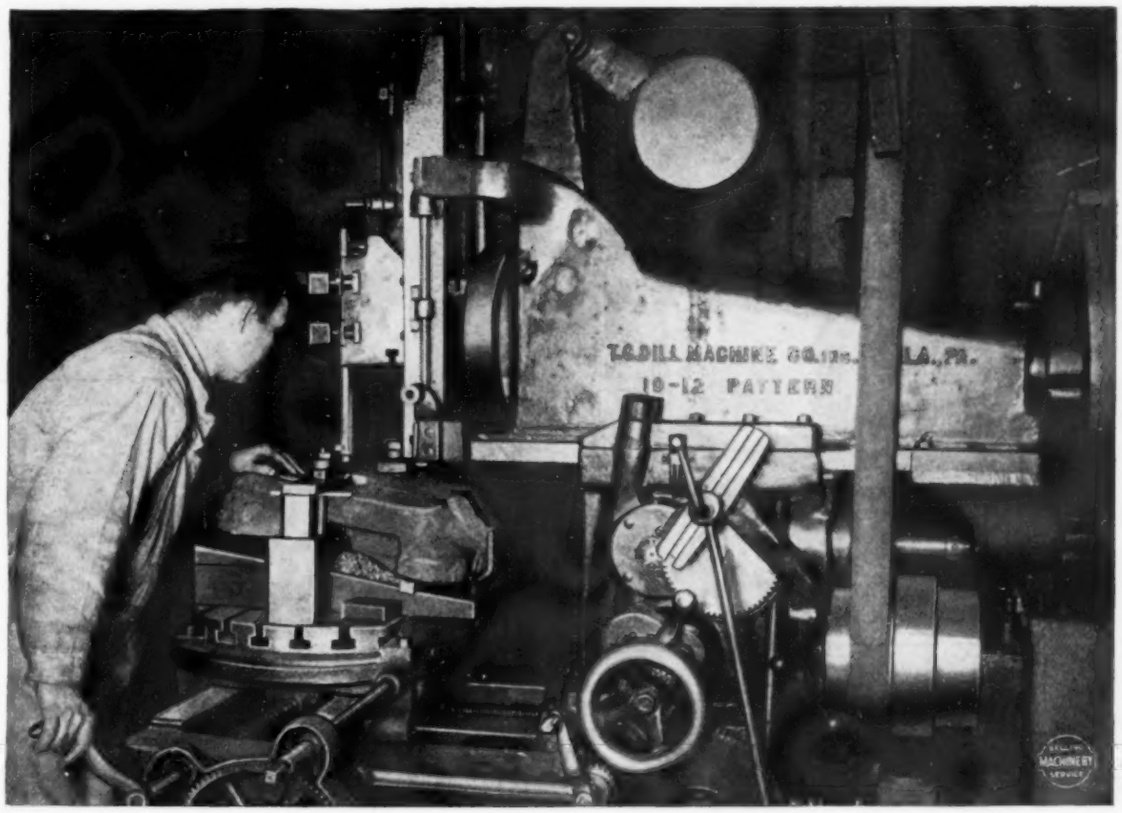
Write for Bulletin A-31

The Federal Machine & Welder Co.

Warren, Ohio, U. S. A.

OFFICES AT:

Warren, Ohio, Dana Ave.
Chicago Ill., 15 South Clinton St.
New York City, N. Y., 17 Battery Place.
New York City, N. Y., 30 E. 42nd St.
Montreal, Canada, 501 Power Bldg.
Cleveland, O., 401-402 Garfield Bank Bldg.
Detroit, Mich., 1516 Ford Bldg.
Philadelphia, Pa., 613 Lincoln Bldg.
Boston, Mass., 19 Huntington Ave.
Niagara Falls, N. Y., 311 Falls St.
Minneapolis, Minn., Builders Exchange Bldg.
Indianapolis, Ind., Board of Trade Bldg.



A Most Difficult Job Handled With Ease

The Dill Slotter

HERE'S another Dill on an unusual job where limits are exceptionally close. The steel casting is the top cross head for a 100,000 lb. capacity, 3-screw testing machine. The irregular opening in this casting approximates a square between three and four inches on a side, and is cut at an angle to the finished face. Despite the peculiar shape of the hole, the size of the casting and the difficult nature of the material, the Dill finishes these castings in good time.

The number of difficult jobs which can be successfully performed by the Dill Slotter makes it a paying proposition in widely varying lines of work, and in contract shops where the next job is often an unknown quantity, the Dill finds its greatest usefulness.

Let us tell you more about this machine

T. C. Dill Machine Company

THE DILL SLOTTER PEOPLE

Philadelphia, Pennsylvania, U. S. A.

FOREIGN AGENTS: Alfred Herbert, Ltd., British Isles; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Belge, Alfred Herbert, Brussels, Belgium; Societe Anonyme, Alfred Herbert, Ltd., Paris, France; Societe Anonima Italiana, Alfred Ltd., Milan, Italy; Allied Machinery Co. of America, Portugal; Allied Machinery Co. de Espana, Barcelona, Spain; Horne Company, Ltd., Tientsin, China; Benson Brothers, Ltd., Sydney, Australia.

UNI

The Cutters and Twist Drills that talk in the language of RESULTS:

Union Twist Drill Co.

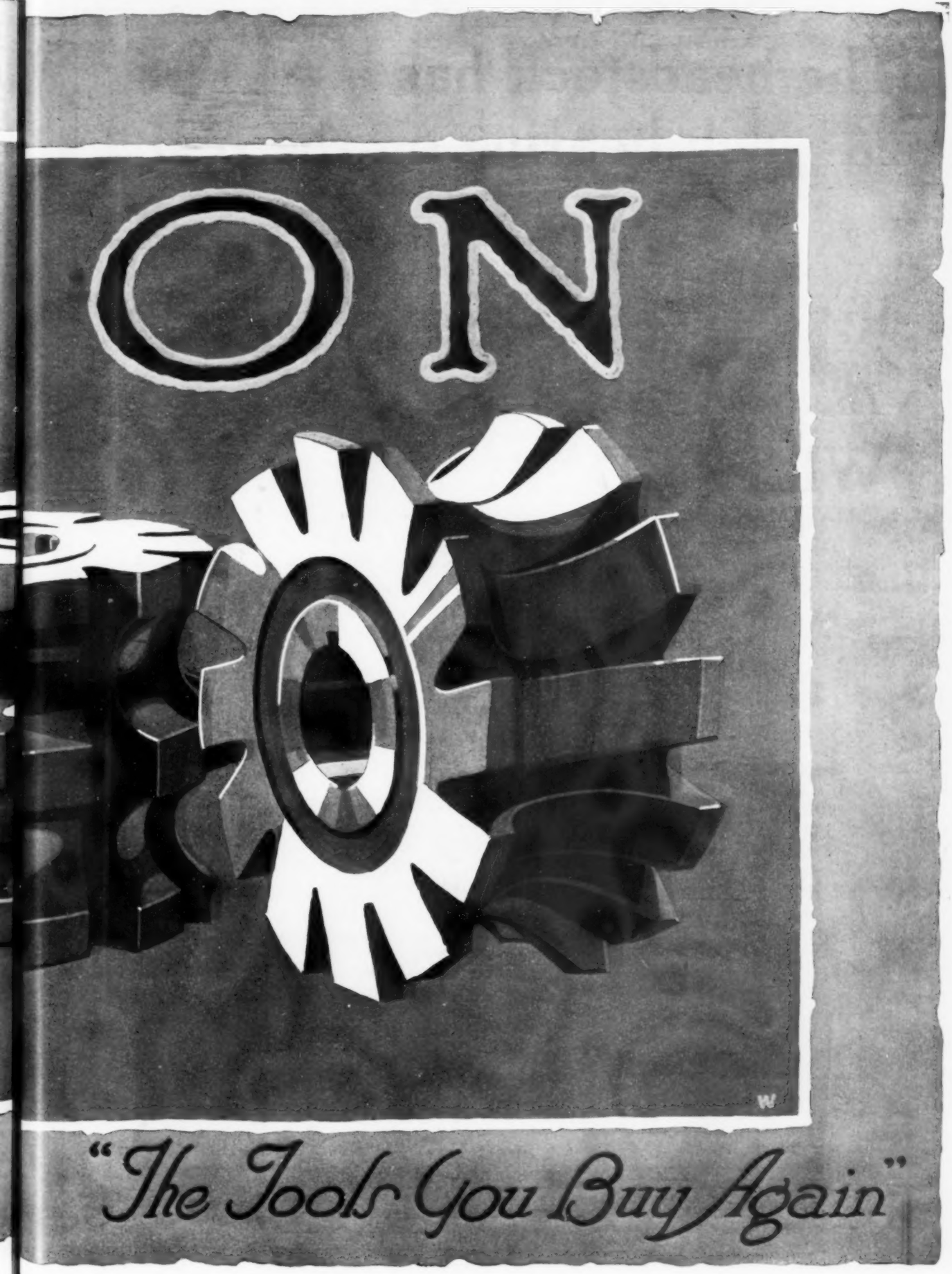
The Drill and Cutter Makers

Athol, Mass.

New York Store, 62 Reade St., E. W. McKeen, Mgr. Chicago Store, 11 So. Clinton St., G. W. Lunger, Mgr.

DOMESTIC AGENTS: G. R. Armstrong, Mfrs. Supplies, 252 Franklin St., Boston, Mass. W. J. Foss & Co., Springfield, Mass. Collieries Supply & Equipment Co., 14 North Fifth St., Philadelphia, Pa. Syracuse Supply Co., Syracuse, N. Y. Homer Strong, 301 State St., Rochester, N. Y. Root, Neal & Co., 178-180 Main St., Buffalo, N. Y. Somers, Fitler & Todd Co., 227 Water St., Pittsburgh, Pa. White Tool & Supply Co., 1313 W. Sixth St., Cleveland, Ohio. V. N. Devou Supply Co., 506 and 508 Central Ave., Cincinnati, Ohio. W. J. Baird Machinery Co., N.E. corner Jefferson and Brush Sts., Detroit, Mich. Vonnegut Machinery Co., 43-45 Meridian St., Indianapolis, Ind. Fred Ward & Sons, 170-174 First St., San Francisco, Calif. McMullen Machinery Co., 66 Ionia Ave., Grand Rapids, Mich. H. A. Harrison, 220 King St., West, Toronto, Ont. National Supply Company, Toledo, Ohio. F. E. Satterlee, 118 No. Washington Ave., Minneapolis, Minn. Badger-Packard Machinery Co., 70 West Water St., Milwaukee, Wis., and Racine, Wis. Neill-Lavielle Supply Co., 505 West Main St., Louisville, Ky. Evansville Supply Co., 1st Ave. and Ohio St., Evansville, Ind.

FOREIGN AGENTS: Great Britain (Drills), Markt & Co., 98-100 Clerkenwell Rd., London. France (Drills), Markt & Co., 107 Ave. de Parmentier, Paris. Norway-Sweden, Denmark, Finland: V. Lowener, Stockholm, Sweden. Australia, Bevan & Edwards, Ltd., 508 King St., Melbourne. Japan, Takata & Co., Tokyo. South America, Adolfo G. Burbanks, 843 Calle Mexico, Buenos Aires, Argentine Republic. Italy (Drills), C. Civita, Milano.


ON
"The Tools You Buy Again"

The headstock has a 21½ inch bearing on the bed

This is but one feature of the New Willard All-Geared Head Lathe.

Some of the other improved features of this up-to-the-minute machine which make it a huge producer are these:

The New

WILLARD

MATTMAN-BRATTEN

Six direct speeds are available and six-further speeds through the back gears, making a total of twelve, and yet it is fool-proof. It is impossible to throw in two different speeds at the same time. All sliding gears are hardened; all gears in the headstock run in oil. All speed changes are selective and are inside the headstock. Spindle is chrome nickel steel forged and bored from the solid. **Ball Bearing throughout.**

Keep your plant equipped with up-to-the-minute new Willard lathes. Write today for catalog.

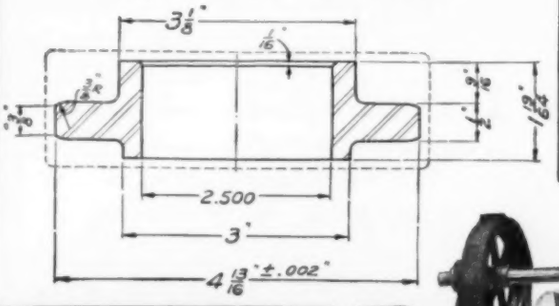
The Willard Machine Tool Company

B Street, Box 784
Cincinnati, Ohio

GISHOLT

Can Your Machines do this much Work in 5½ Minutes

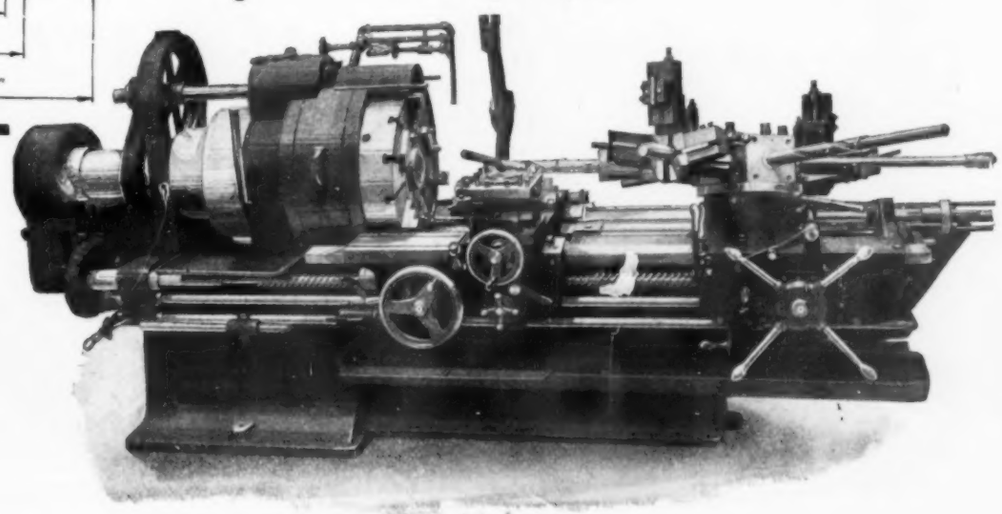
5½ MINUTES



The best way for you to answer this question satisfactorily is to compare the time named with your time on similar parts.

Many manufacturers throughout the world are increasing their production and reducing manufacturing costs by the use of the Gisholt Standard Turret Lathe.

There is a Gisholt representative ready to assist you in selecting the right machine for your work. Write for him. There will be no obligation on your part.



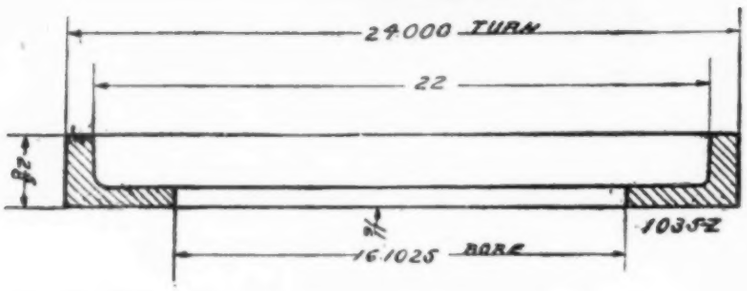
Standard Gisholt Turret Lathe equipped with Standard Chucking Tools

GISHOLT MACHINE CO., 1201 East Washington Ave. MADISON, WIS., U. S. A.

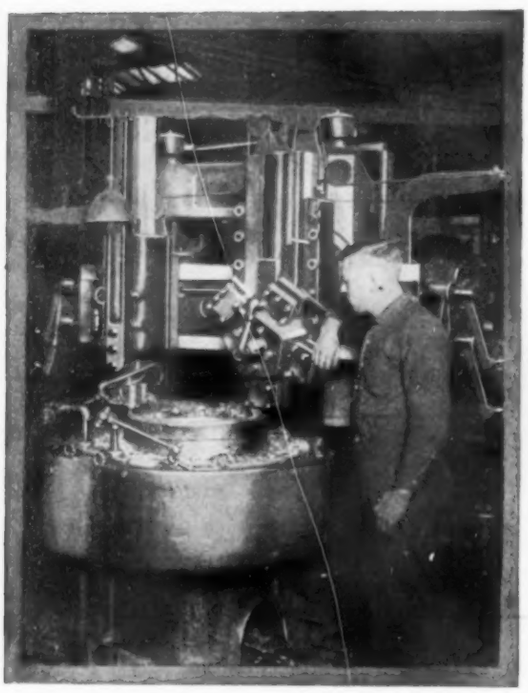
Builders of Standard and Automatic Turret Lathes, Vertical and Horizontal Boring Mills, Tool Grinders, Small Tools, Special Machinery, etc.

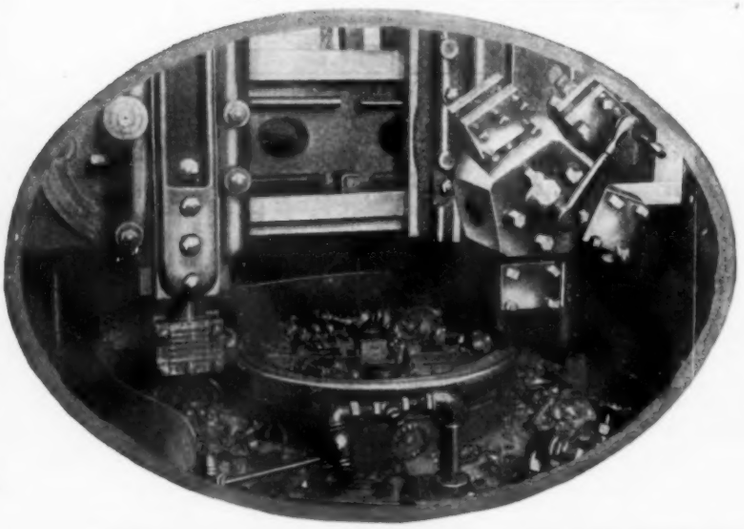
Eastern Sales Office: 30 Church St., New York *Works:* Madison, Wis., Warren, Pa.

Getting 40 Minutes



First Operation 15 Minutes
2nd " 15 "
3rd " 10 "





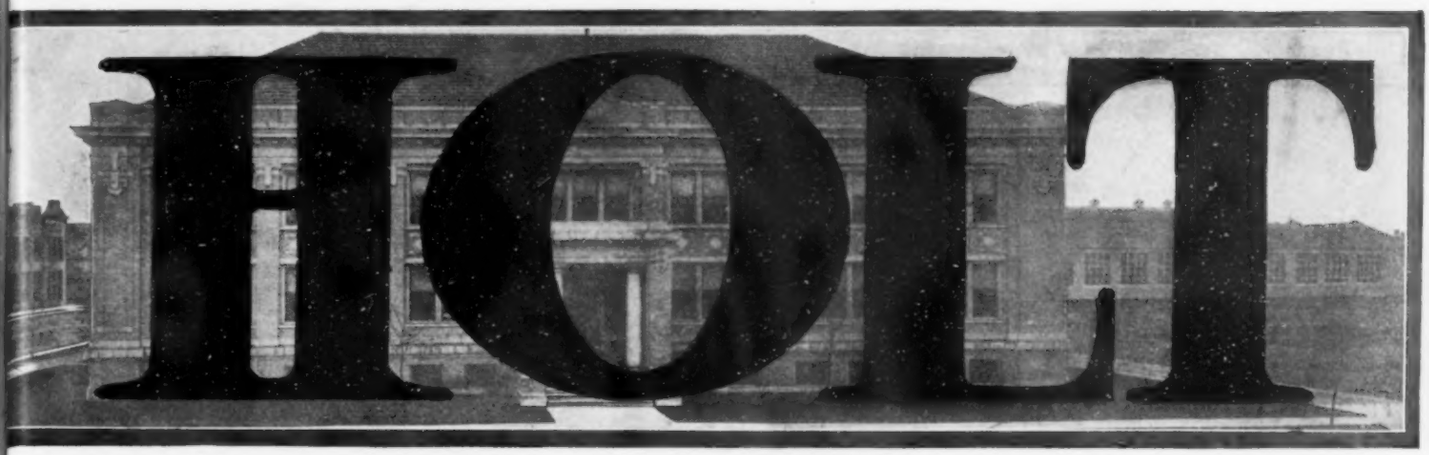
GISHOLT MACHINE COMPANY, 1201 EAST

Builders of Standard and Automatic Boring Mills, Tool Grinders,

Eastern Sales Office: 30 Church St., New York,

AGENTS:

Atlanta, Ga., Seeger Machine Tool Company; Buffalo, N. Y., J. L. Osgood; Chicago, Ill., Stocker-Rumely-Wachs Co.; Denver, Colo., Hendrie & Bolthoff Mfg. & Supply Co.; Detroit, Mich., Chas. A. Strelinger Company; Indianapolis, Ind., Vonnegut Machinery Co.; Los Angeles, Calif., Smith-Booth-Usher Co.; New Orleans, La., P. H. McArdle; Philadelphia, Pa., Swind Machinery Co.; Portland, Ore., Portland Machinery Co.; Rochester, N. Y., Ogden R. Adams; St. Louis, Mo., Colcord-Wright Mchy. & Supply Co.; St. Paul, Minn., Savage & Winter Company; Salt Lake City, Utah, Salt Lake City Hdw. Co.; San Francisco, Calif., F. O. Stallman Supply Co.; Seattle, Wash., Perine Mchy. Company.



Economical Production with Gisholt Machines

Imagine this 42-in. Vertical Boring Mill in your shop finishing similar work.

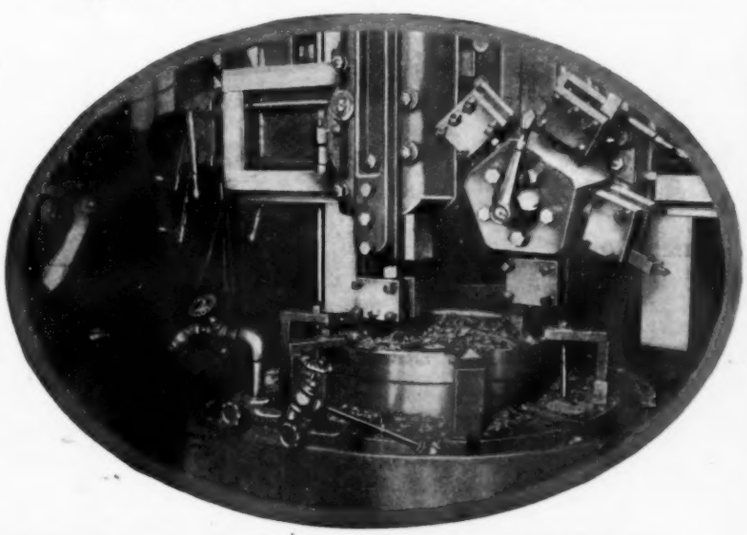
How would this production influence the cost of your work?

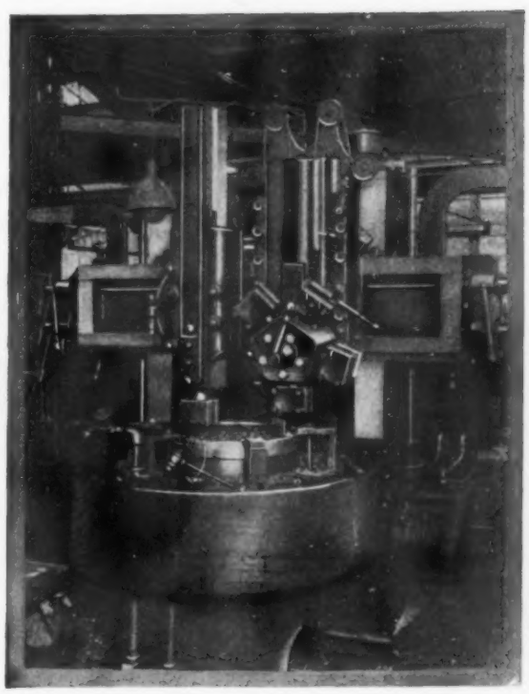
Our representative is ready to tell you how Gisholt Boring Mills will help on your work.

Don't you think that it would pay to find out whether you can better your present methods—and how much?

This service is gladly rendered without cost or obligation.

Isn't it worth testing?
Suppose you wire or write us for an appointment.





WASHINGTON AVE., MADISON, WIS., U. S. A.

Turret Lathes, Vertical and Horizontal
Small Tools, Special Machinery, etc.
Works: Madison, Wis., Warren, Pa.

Canada: Canadian Fairbanks-Morse Co., Calgary, Hamilton, Montreal, Ottawa, Quebec, St. John, Toronto, Vancouver, Winnipeg.

FOREIGN:

Australia, Benson Bros., Sydney, Melbourne; Belgium, Ateliers Demoor, Brussels; Great Britain, Burton, Griffiths & Co., London, Birmingham, Manchester and Glasgow, Scotland; France, Aux Forges de Vulcain, Paris; Italy, Emanuele Mascherpa, Milan; Japan, Andrews & George, Tokyo; Norway, Union Machine Co., Christiania; Sweden, Axel Ryden, Stockholm; Switzerland, J. Lambercier & Co., Geneva.

GISHOLT

Place Yourself in this Man's Chair

Imagine that you are this Superintendent.

Periodograph control will bring to you, just as it is bringing to him, the true story of inefficiencies which are hidden as long as operators are permitted to judge their time.

There can be no question as to the correctness of piece work prices or bonus estimates. Delays in the movement of material are quickly detected. Production is increased. Production hours lost due to absence are readily computed.

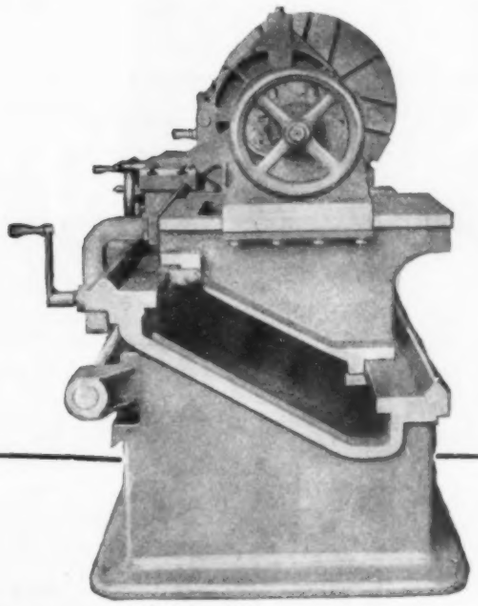
Don't you think that such information would enable you to improve conditions—to increase production?

A Gisholt Salesman will gladly call and answer those questions which are in your mind.

GISHOLT MACHINE CO. 1201 East Washington Ave. MADISON, WIS., U. S. A.

Eastern Sales Office: 30 Church St., New York *Works:* Madison, Wis., Warren, Pa.

Periodograph Sales Agent for San Francisco, Calif., F. A. Thomas Co.



The dropped V puts the "All" in—McCabe's "All-in-1"

With the rear V lower than the front V plenty of room is provided for all sizes of work from that requiring a 24-inch swing to that requiring a 40-inch swing.

It's an economy in lathes worth thinking about, isn't it? You need no other lathe in your shop as far as size of work goes. You can be sure of rigidity, too, even under the strain of the heaviest cuts.

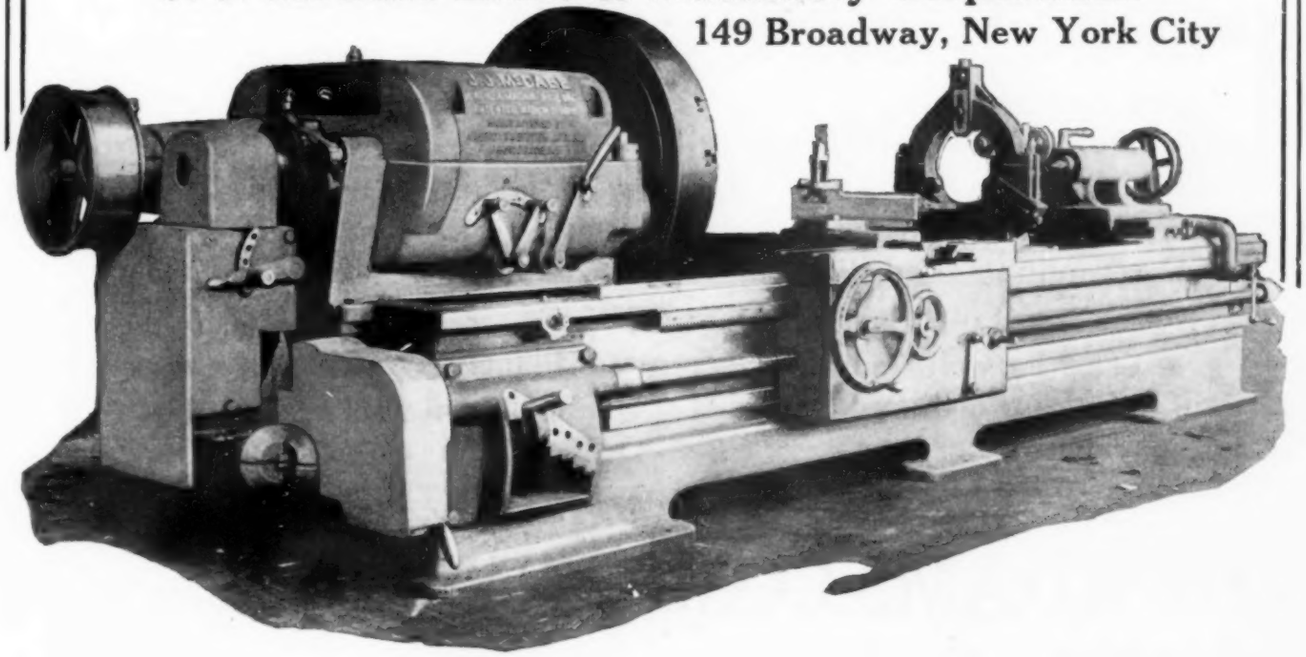
The head and tool are thoroughly braced. The gear case and cover are heavily constructed conforming to the rugged design of the entire lathe; thus the *"All-in-1"* withstands excessive strains. The more you know about this *"All-in-1"* the more convinced you become of its marvelous economy for your shop.

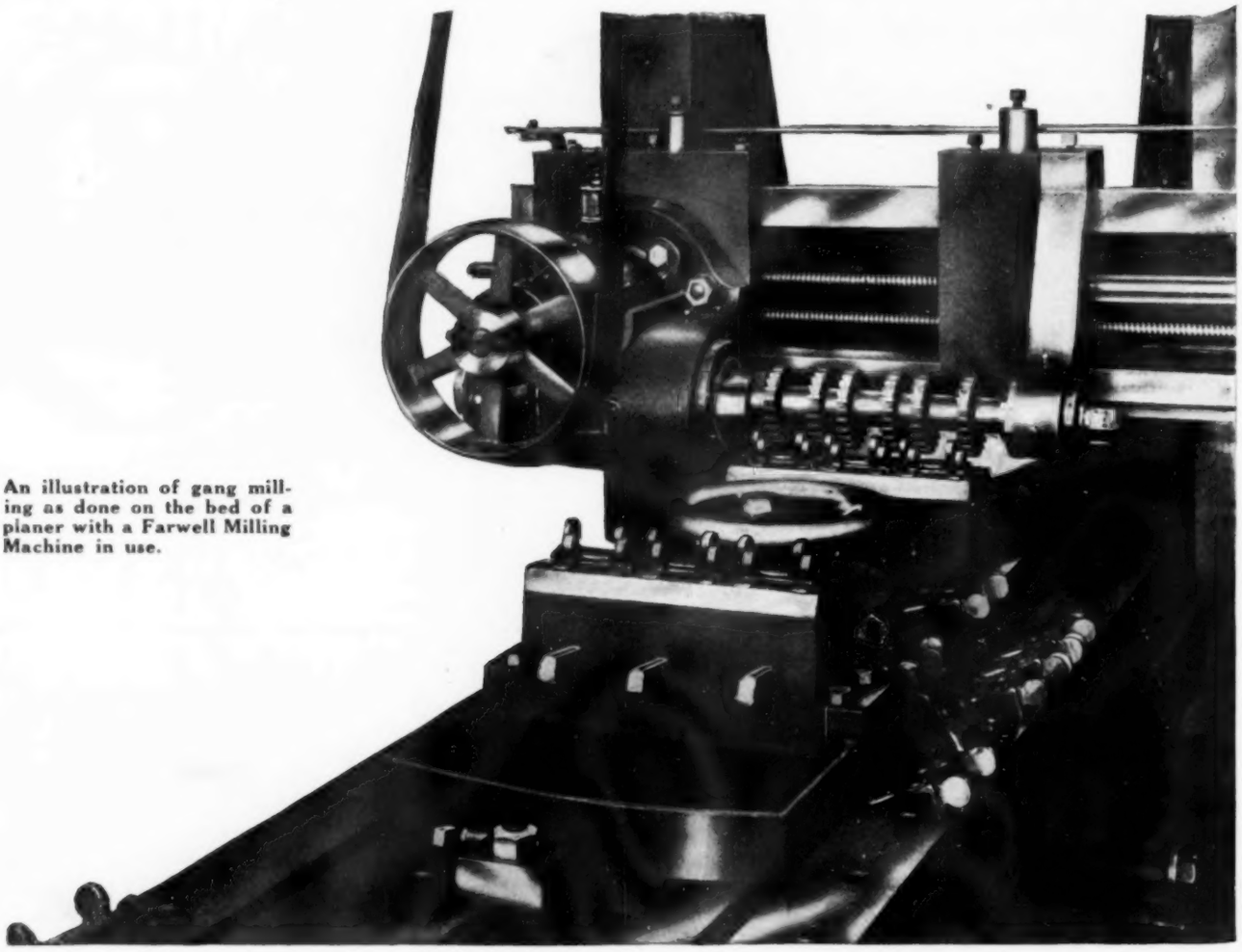
$1000 to $2000 saved on the price of a 40-inch geared-head lathe—and the *"All-in-1"* offers the added facilities for handling anything that comes along, large or small.

Give us your name and address and we'll send you Bulletin A.

J. J. McCabe Lathe & Machinery Corporation

149 Broadway, New York City





An illustration of gang milling as done on the bed of a planer with a Farwell Milling Machine in use.

The Farwell Milling Machine

—It Simplifies Matters Regarding Production

Lack of floorspace might be an obstacle which some manufacturers have to contend with when they find themselves in need of new equipment.

By the use of the Farwell Milling Machine, you consume no more floorspace than you are already using. It is simply a machine that goes on the rail of your planer, which will convert it into a vertical or horizontal milling or drilling machine, without interfering with planer operations in any manner whatsoever.

The Farwell Milling Machine for Planers is suitable for any kind of milling or drilling, the size of which is limited only by the extent of the planer bed.

Ask us for Catalogue No. 58.

THE ADAMS COMPANY, 1908 BRIDGE STREET DUBUQUE, IOWA, U. S. A.

STEAMSHIP ROUTES

Unusual Shipping Facilities are provided by the Erie Barge Canal, in addition to three railroads, as shown by the map below. Thus we are assured uninterrupted deliveries in all directions. Over night shipments to New York via boat.

Prompt shipments from our warehouse stock at Watervliet, N. Y., Detroit, Mich., Chicago, Ill., or Cambridge, Mass., handled through our Branch Offices.

Ludlum Steel Company
General Offices and Works: Watervliet, N.Y.

BRANCH OFFICES
New York City Philadelphia Cambridge
Cincinnati Detroit Chicago
Cleveland Buffalo

LUDLUM STEEL
Consistently Uniform

Mohawk Extra
High Speed Steel

Pompton
Carbon Tool Steel

Albany
Alloy Tool Steel

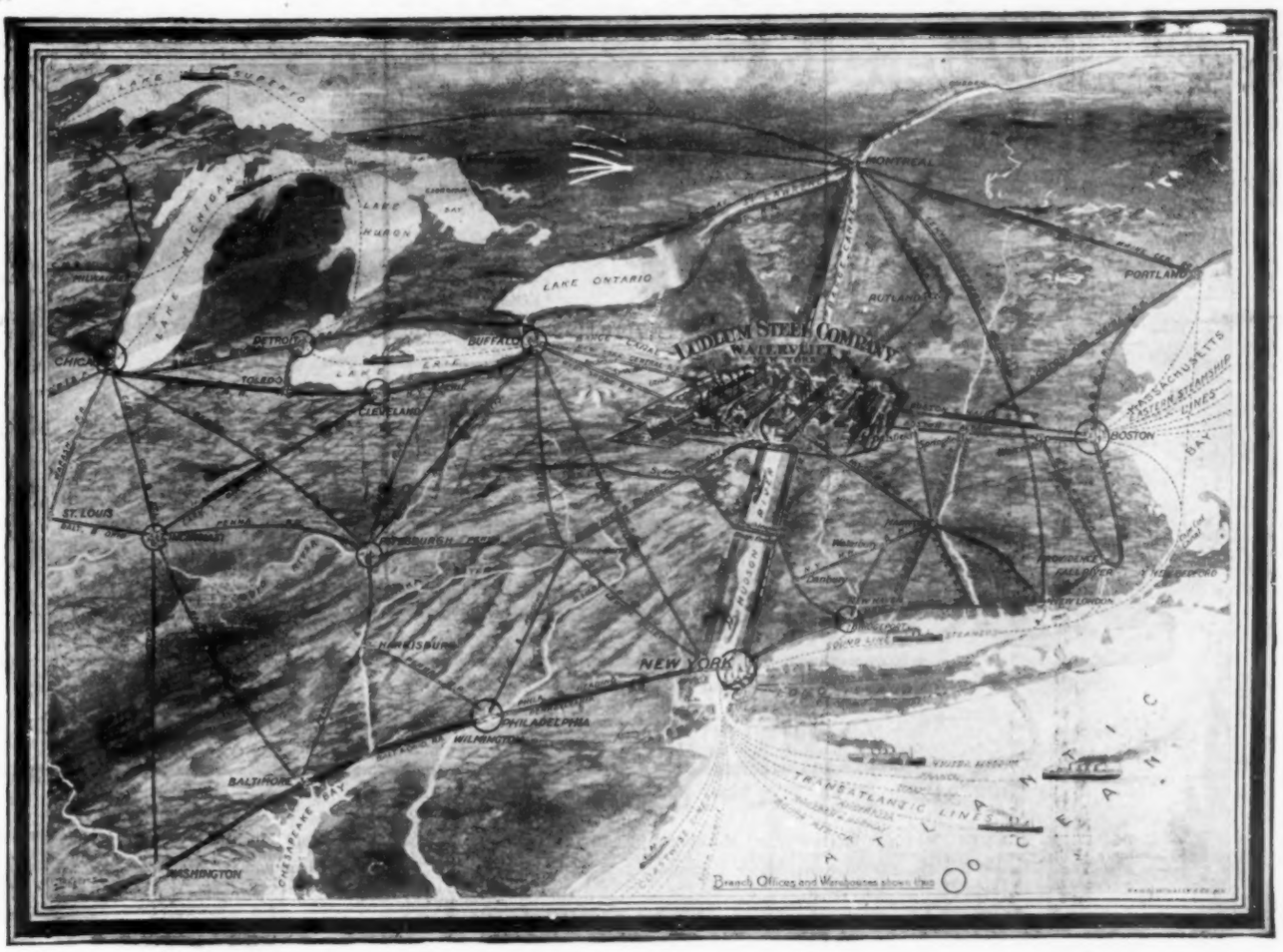
Oneida
Oil Hardening Steel

Huron
Alloy Die Steel

Teton
Ball Bearing Steel

Yuma
Chrome Magnet Steel

Seminole
"Foolproof" Chisel Steel



The More the Merrier When It Comes to Shapers

That is what a very great number of users of G & E Shapers seem to think.

This is a typical installation.

Bearing this in mind, it is easy to understand why so many G & E Shapers have been sold. The number is approaching 13,000 now.

This condition shows GREAT CONFIDENCE in Gould & Eberhardt Shapers.

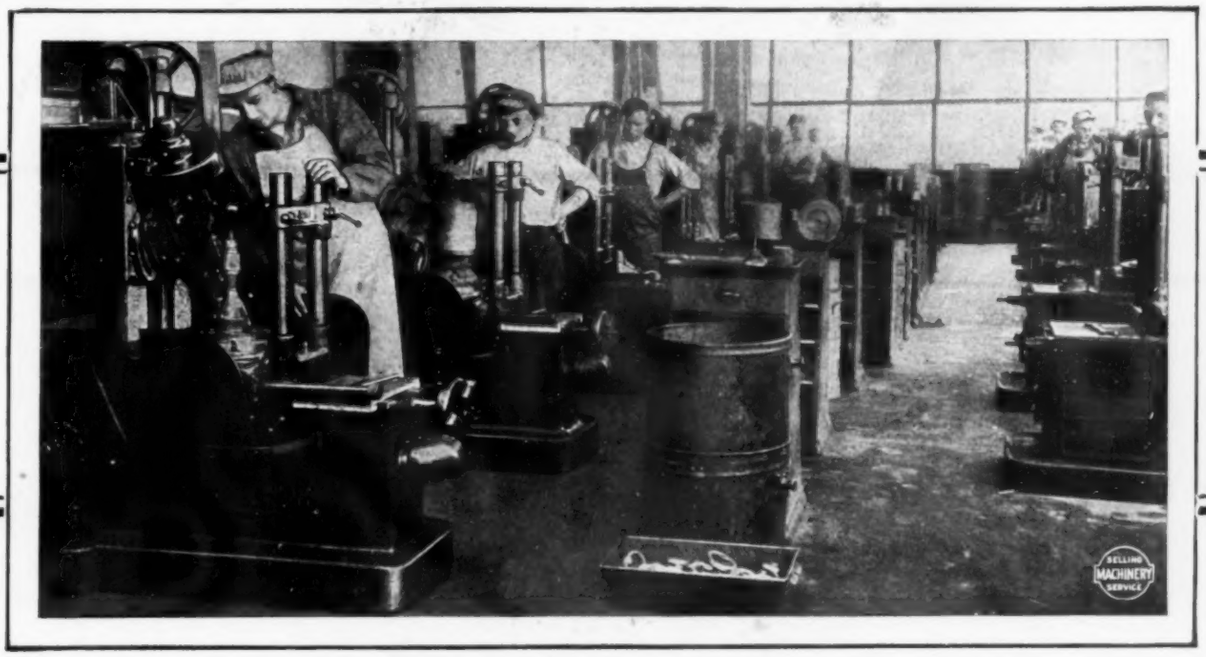
Get Our Bulletins on Shapers

GOULD & EBERHARDT

"HIGH DUTY" AUTOMATIC GEAR AND

ESTABLISHED 1833

DOMESTIC AGENTS: Motch & Merryweather Machinery Co., Cleveland, Pittsburgh, Detroit and Cincinnati. Henry Prentiss & Co., New York, Boston, Buffalo, Syracuse, Rochester, Scranton. Marshall & Huschart Machinery Co., Chicago and Milwaukee. Marshall & Huschart Machinery Co. of Indianapolis, Indianapolis, Ind. Elliott & Stephens Machinery Co., St. Louis. W. E. Shipley Machinery Co., Philadelphia. Kemp Machinery Co., Baltimore and Richmond. Hallidie Machinery Co., Seattle. Hallidie Co., Spokane. Dewstoe Machine Tool Co., Birmingham, Ala. Seeger Machine Tool Co., Atlanta, Ga. Robinson Cary & Sands Co., St. Paul and Duluth, Minn. Eccles & Smith Co., Los Angeles, San Francisco and Portland, Ore.



Where Reliable Hobbers Are Absolutely Necessary

The automobile industry uses immense numbers of G & E Gear Cutting and Hobbing machines. Great production and substantial economies have resulted from their use. A battery of G & E Hobbers is shown here in the plant of the Continental Motors Company. They are cutting phosphor bronze spiral gears.

G & E machines are made in styles and sizes to handle any gear proposition. Our Engineering Department is ready to take hold of your problem and offer helpful suggestions.

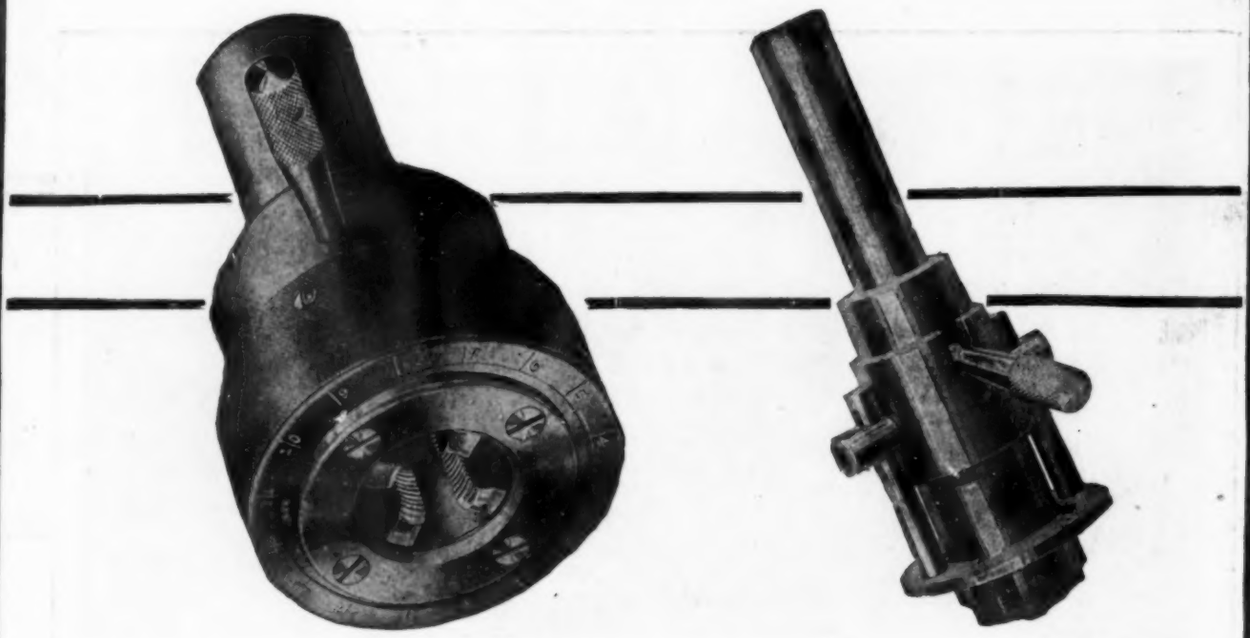
and Gear Cutting Machinery

BERHARDT

SHAPERS
RACK CUTTING MACHINERY

NEWARK, N.J. U.S.A.

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London, England. R. S. Stokvis & Zonen, Ltd., Rotterdam. R. S. Stokvis & Fils, S. A., Paris and Brussels. D. Drury & Co., Johannesburg, S. Africa. A. R. Williams Machinery Co., Canada. Horne Co. Ltd Tokyo, Japan. Victor G. Mendoze, Havana, Cuba. Allied Machinery Co. of America, Switzerland, Italy, China, Spain and Portugal. Chr. A. Herstad, Copenhagen, Denmark. Pedro Martinto, Lima, Peru South America.



Replace Your Solid Tools with the—MURCHEY

Murchey Collapsing Taps and Self-opening Dies are fast replacing the solid tools.

Wherever solid taps and dies have been used, there you can use the Murchey tools to advantage. Murchey Tools do the work solid tools can do; and more accurately, more rapidly, more economically.

When chasers are worn out, replace with another set. Balance of tool lasts for years. The design of Murchey Tools prevents any displacement of chasers.

You can boost your production with Murchey Taps and Dies. What work are you handling?

Murchey Machine and Tool Co.

Detroit, Michigan

UNITED STATES OF AMERICA

Coats Machine Tool Co., 14 Palmer St., Westminster, London, S. W., England

Fenwick Freres & Co., Paris, France.

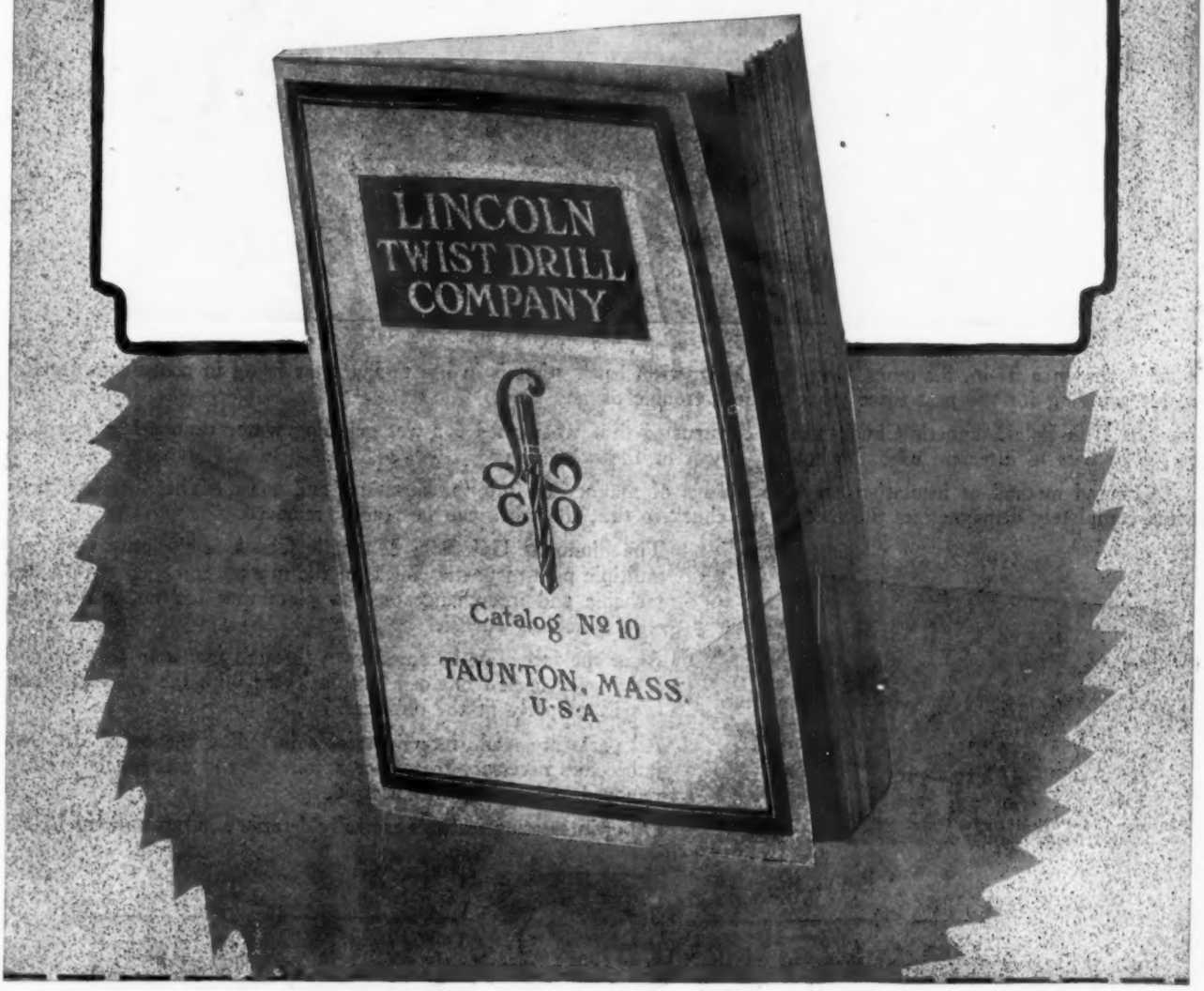
Learn the Latest facts in
LINCOLN TOOLS

Just fill in and mail the coupon at the bottom of this page. In return you will get the Lincoln Catalog No. 10A—a small volume easy to handle and full of valuable "dope" on Self-oiling Drills, Twist Drills, Milling Cutters, Reamers, Screw Slotting Cutters and kindred tools.

An excellent little reference book, too, because of the tables and useful information it contains in addition.

Mail the coupon now while you are thinking of it.

Lincoln Twist Drill Co., Taunton, Mass., U. S. A.



TO THE LINCOLN TWIST DRILL CO.,
Taunton, Mass.

Send me, without delay, my copy of your new catalog, No. 10A.

Name ..... Position .....

Firm ..... Address .....

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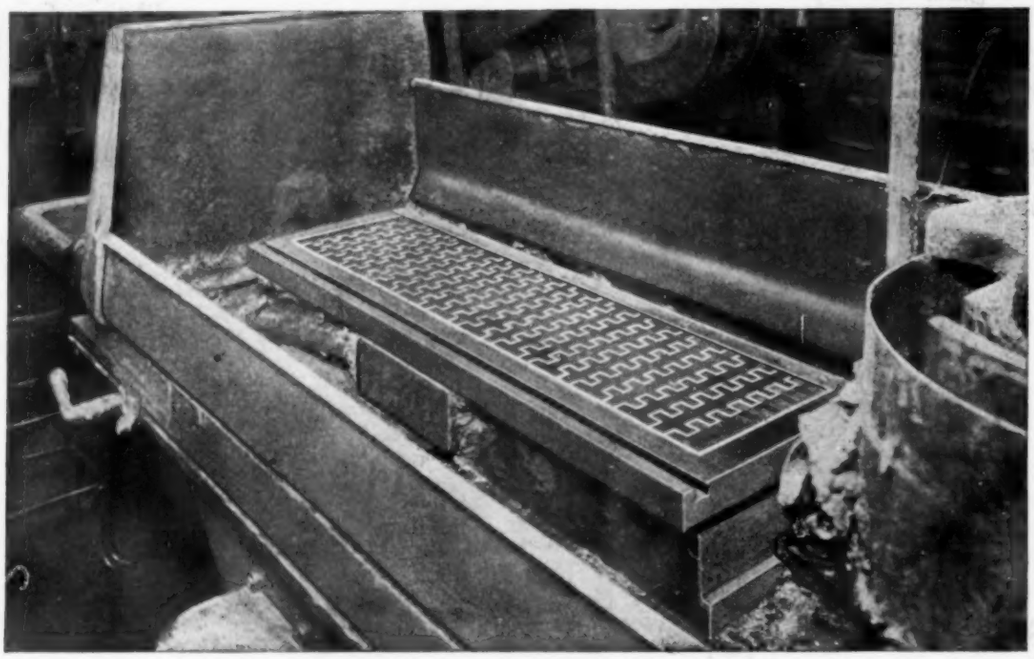
AM

Three Years' Continuous Service on Wet Grinding Simmons Unit-Pole Magnetic Chuck



Above is shown a 31-in. Simmons Unit-Pole Magnetic Chuck that is in use to-day after being in continuous service on wet grinding for the past three years without trouble of any kind.

Simmons Unit-Pole Magnetic Chucks are so constructed that when used for wet grinding water cannot leak through the top or base to interfere with the holding power or the windings.

The patented method of insulation prevents leakage of magnetism into the machines and tools. The demagnetizing switch completely demagnetizes the face of the chuck so that the work can be readily removed.

Simmons Unit-Pole Magnetic Chuck with T-Slot face plate for heavy grinding and use on Milling Machine or Shaper

The Simmons Unit-Pole Magnetic Chuck is the only unit coil multiple pole magnetic chuck on the market equipped with a detachable and interchangeable face-plate that has no dead spaces on the holding surface.

After the face-plate becomes worn through use or in any manner is damaged, a new one can be substituted with the assurance that it will properly fit the old base.

All parts are made interchangeable including the coils. In case it becomes necessary to replace a coil, the old coil can be readily removed and a new one inserted.

Other interesting features are fully described in our bulletin 107A.

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

New York: Woolworth Bldg. Chicago: First National Bank Bldg. Cleveland: 10708 Hampden Ave. Detroit: Majestic Bldg. TAFT PEIRCE PRODUCTS CARRIED IN STOCK BY Syracuse Supply Co., Syracuse, Buffalo, Rochester; Cadillac Tool Co., Detroit; Sherritt & Stoer Co., Philadelphia; Wm. M. Pattison Supply Co., Cleveland.

2086

FARWELL GEAR HOBBER

Accurate Work — Economical Operation

This No. 1 Farwell Gear Hobber has seen three years' service in the Lansing (Michigan) plant of the Bean Spray Pump Company.

Though put to severe usage during this time, not one cent has been spent for repairs.

The above illustration shows the hobbing of 18 tooth, 6 pitch gears, 1½ in. face. These gear blanks, of 30 to 40 point carbon steel, are cut three at a time on the No. 1 Farwell Gear Hobber.

This machine is capable of cutting gears from 14 in. in diameter down to the very smallest. We can furnish machines for cutting gears up to 36 in. in diameter, the range including spur gears, spiral gears, worm wheels, sprockets, ratchets and spline shafts.

Let us send you full details

THE ADAMS COMPANY

1904 Bridge Street
Dubuque, Iowa, U. S. A.

ALOXITE DISCS AND FAFNIR BEARINGS

ONE thousand outer rings of Fafnir Radial Ball Bearings are faced on both sides with two Aloxite Discs in a ten hour day. The rings are 7.4804 inches outside diameter. The Aloxite Discs used are eighteen inches in diameter in 36 grit.

Fafnir methods of making the splendid Fafnir Bearings call not only for extreme care and accuracy, but for quick efficient methods of production.

So when it came to the proposition of facing the rings,

ALOXITE DISCS MEASURED UP TO THEIR STANDARDS

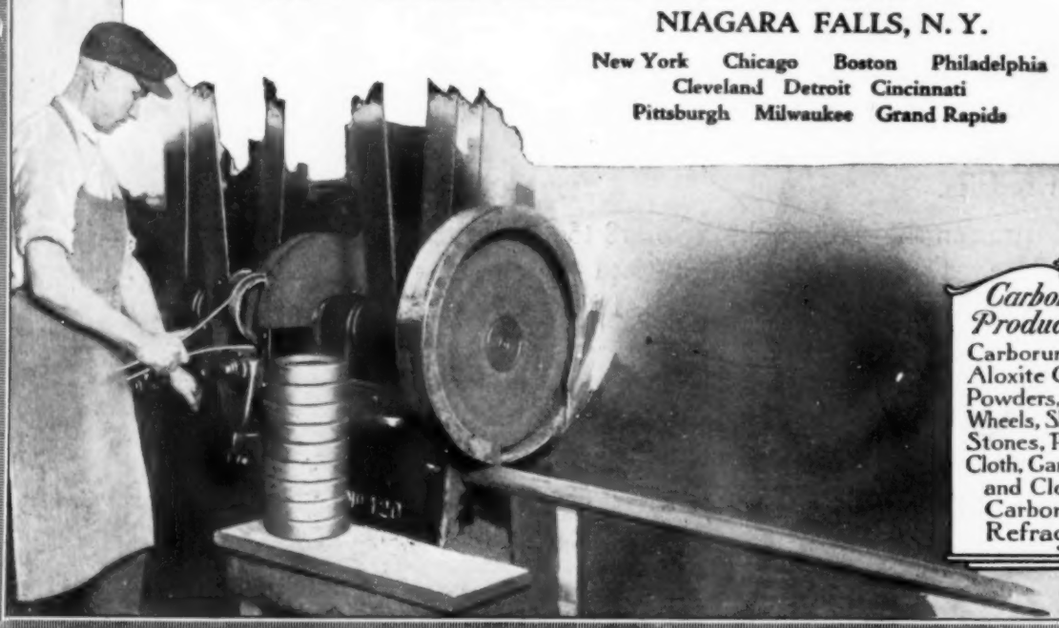
They are Discs that are cut clean and free.
They are Discs that are uniformly coated with hard, sharp, tough, Aloxite Grains and they are built for real grinding efficiency.

Aloxite and Carborundum Discs can be made to definitely meet YOUR Discing conditions

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

New York Chicago Boston Philadelphia
Cleveland Detroit Cincinnati
Pittsburgh Milwaukee Grand Rapids



Carborundum Products are:
Carborundum and Aloxite Grains and Powders, Grinding Wheels, Sharpening Stones, Paper and Cloth, Garnet Paper and Cloth and Carborundum Refractories

Would You Drive a Tack With a Sledge Hammer?

STAR LATHES

In these times of reconstruction every machine tool must be run to capacity. It is a useless waste of time and power to set up the small job on the big machine.

The progressive manufacturer grades the job to the machine and realizes full value in labor, power and output.

"Star" Lathes are the product of a specialty shop. They are the result of 36 years' experience in the manufacture of tools that satisfy. From the selection of the raw materials to the final rigid test and inspection before shipment, they pass through the hands of master engineers and mechanics.

Labor turnover is no problem in the **"Star"** shops because every man is influenced to do his **best** to produce the **best.**

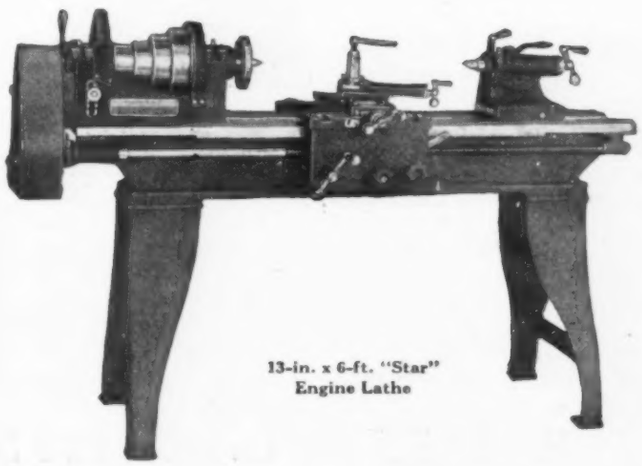
If construction, finish, interchangeability of parts, floor space, power consumption, ease of operation, speed in output and long life interest you in a tool of this class—the **"Star"** is *your* lathe.

Our latest Catalog fully explains details that many makers would call features. Send for one and convince yourself that "Star" Lathes are superior.

The Seneca Falls Mfg. Co.
Incorporated
Seneca Falls, N. Y., U. S. A.

9-in. x 4-ft. "Star" Engine Lathe

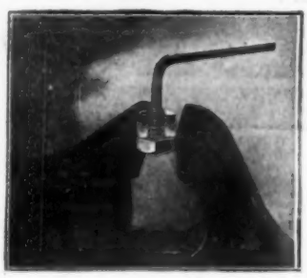
11-in. x 5-ft. "Star" Engine Lathe on oil pan



13-in. x 6-ft. "Star" Engine Lathe

Try the Strength of Your Set Screws—Test Their Economy

Statements as to comparative strength of Hollow Set Screws may be proved or disproved by the user who follows out the tests below. That *value* does not lie in *claims,* but in an unreserved show-down, is a principle in ALLEN advertising. These tests prove roughly what more technical tests prove precisely: that the ALLEN patented process increases the strength of the screw fully 30% over that of *broached* hollow screws—the only other kind made.



Screw Economy *and* Labor Economy *in the* ALLEN Safety Set Screw

Try These Tests

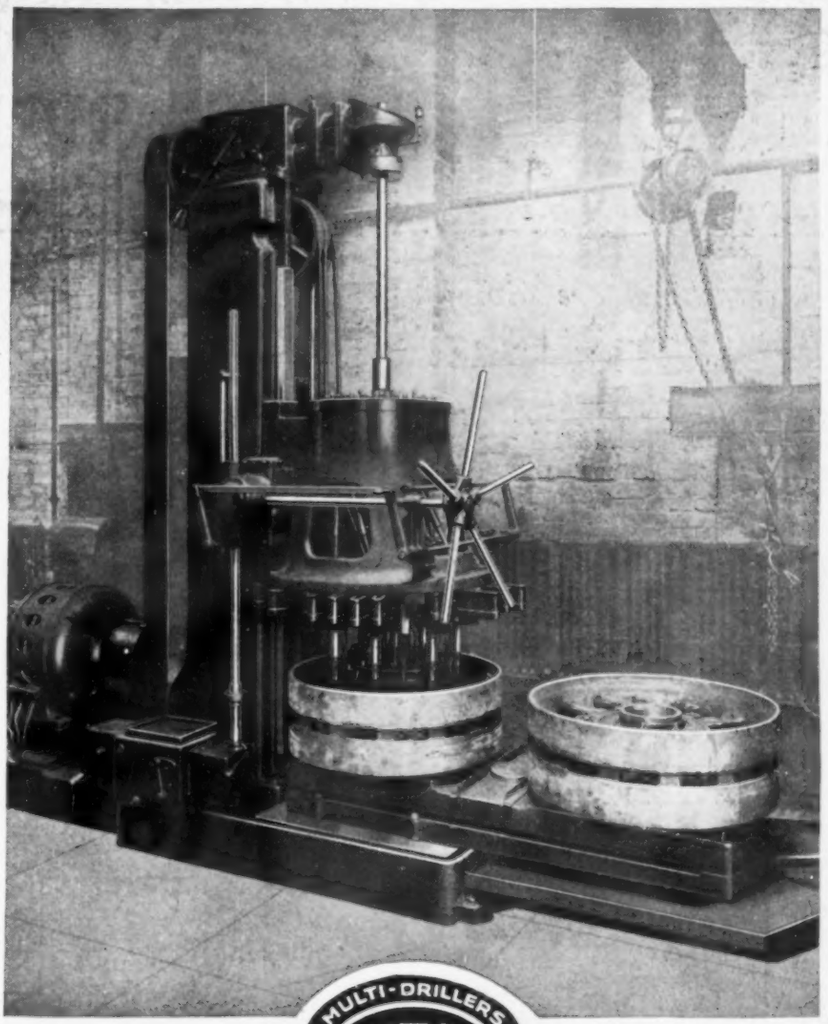
SET UP in a vise a block like the one shown at left (sectional view), threaded preferably for a ¼ in. set screw. (The Allen Company will be glad to furnish such blocks, free of charge, to prospective users.) Turn in a set screw from lower end of the block, to serve as a plug during your tests. Then from the upper end turn in the screw to be tested, until it is flush with the top of the block and set tight against the screw underneath. Apply pressure as in the second view; turn until the screw or the wrench breaks. If it's an ALLEN screw the socket will hold; it will *not* ream out or mushroom.

Next loosen the screw until about half its length is *out of the block.* Insert the wrench to the bottom of the hexagon hole, then pull up on the handle as in the lower view, until the screw or the wrench gives away. You will easily tear out or snap a broached screw, or any screw other than the ALLEN—but your wrench will break before an ALLEN screw will.

These tests eliminate every Hollow Set Screw but one. The ALLEN will stand them. The ALLEN alone has the requisite strength.

The longest-wearing set screws cost the least in the end; you pay a little more for the 30% extra strength in the ALLEN, but you get a lot more in service. You get a reduction in labor costs, by saving work on reamed-out and mushroomed set screws. The clean, perfectly-formed Allen socket-holes hug the wrench through innumerable set-ups. And the walls are abnormally strong—made so by a patented process. The Allen booklet gives the particulars; write for copy.

THE ALLEN MFG. CO., 129 Sheldon St., Hartford, Conn.



The "Hole" Story in one word

26 Holes in Each Wheel—50 Sets of Wheels in 24 Hours

LET Mr. Klinger, Chief Engineer of the Dayton Steel Foundry Company, tell you about it, for it was done in their plant. "On Rear Truck Wheels, we drilled at one setting seven 9-16 in. holes through the spokes and twelve 33-64 in. holes in the hub flange. Then, without any change in the drills or jigs, the wheel was turned over and seven 9-16 in. holes were put through the spokes from the opposite side. The drill was kept practically in continuous operation, turning out 50 complete sets of wheels in 24 hours."

The machine doing the work is the Natco No. 30 High-Speed Multiple Drill, with motor drive and turn table. This machine has a constant speed drive, six changes of gear feeds, six changes of speeds, centralized front control, and our patented Independent Change of Drill Speeds—all very important factors in getting maximum production.

NATCOS are built in 11 sizes ranging from 2 to 72 spindles.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

The National Automatic Tool Company

Richmond, Indiana, U. S. A.

List of NATCO foreign agents

Burton, Griffiths & Co., British Isles
E. Isbecque & Co., Belgium
Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland
Aux Forges de Vulcain, France

We Repeat:

"It's RADICAL and It's RIGHT"

Proof? **Sure!** **Users Say:**

"Your machines are giving excellent satisfaction."

"We are pleased to advise excellent satisfaction both as regards productive capacity and accuracy."

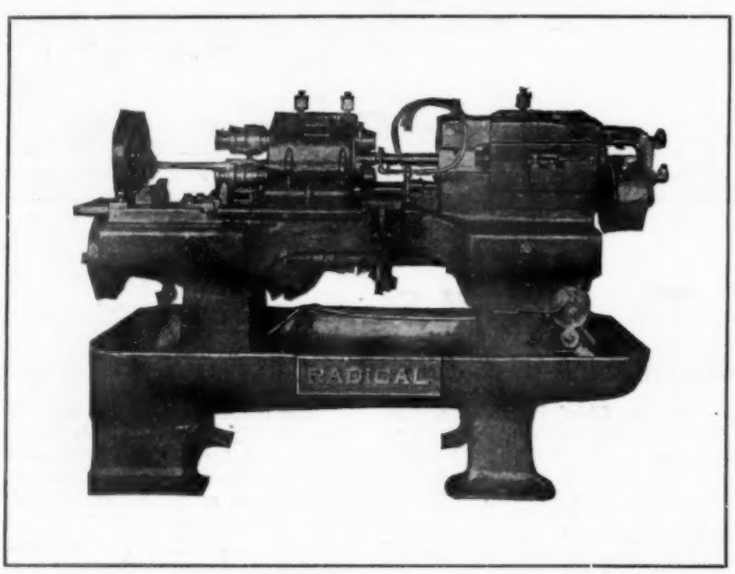
"The RADICAL Automatic is All Right!"

"It is a pleasure to report that they have not given us one moment's trouble."

"They have done everything we have asked of them."

"We are certainly pleased with this machine."

THE RADICAL AUTOMATIC

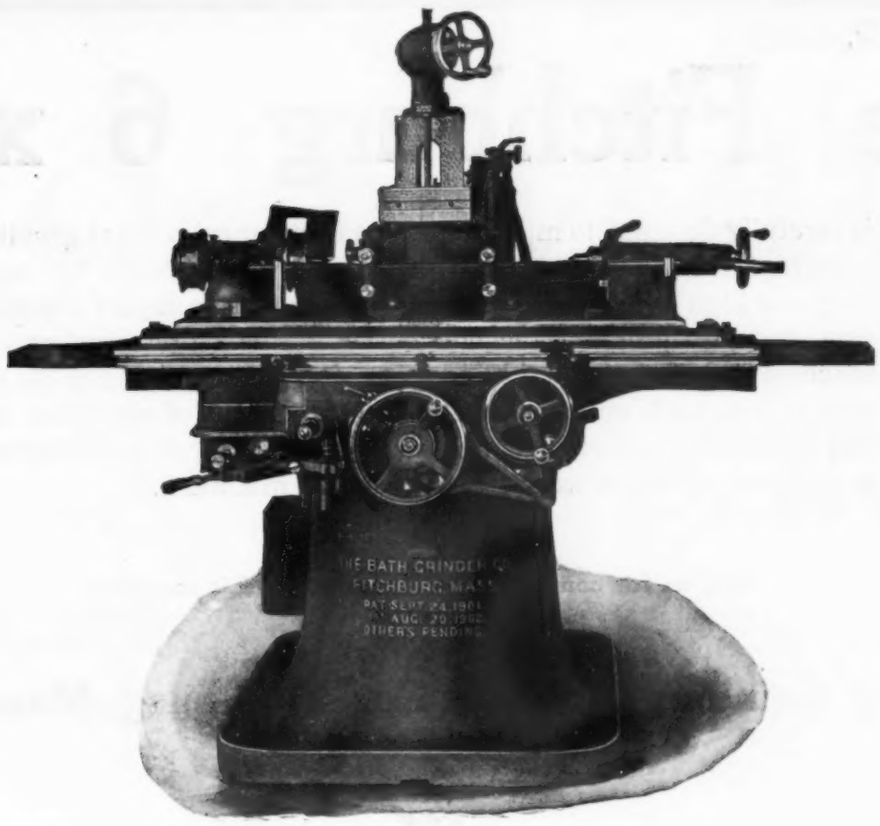


The firms above quoted—Investigated, Bought and were Pleased with Radical Simplicity

P. W. V. Automatic Machine Corporation

Middle West Sales Office:
74 Brush St., Detroit, Mich.

Eastern Sales Office:
320 5th Ave., Room 912, New York, N. Y.



BATH UNIVERSAL GRINDING MACHINE

For Cylindrical, Surface, Internal, Tool and Cutter Grinding

Built by

Universal Grinding Machine Co.

Fitchburg, Mass., U. S. A.

AGENTS

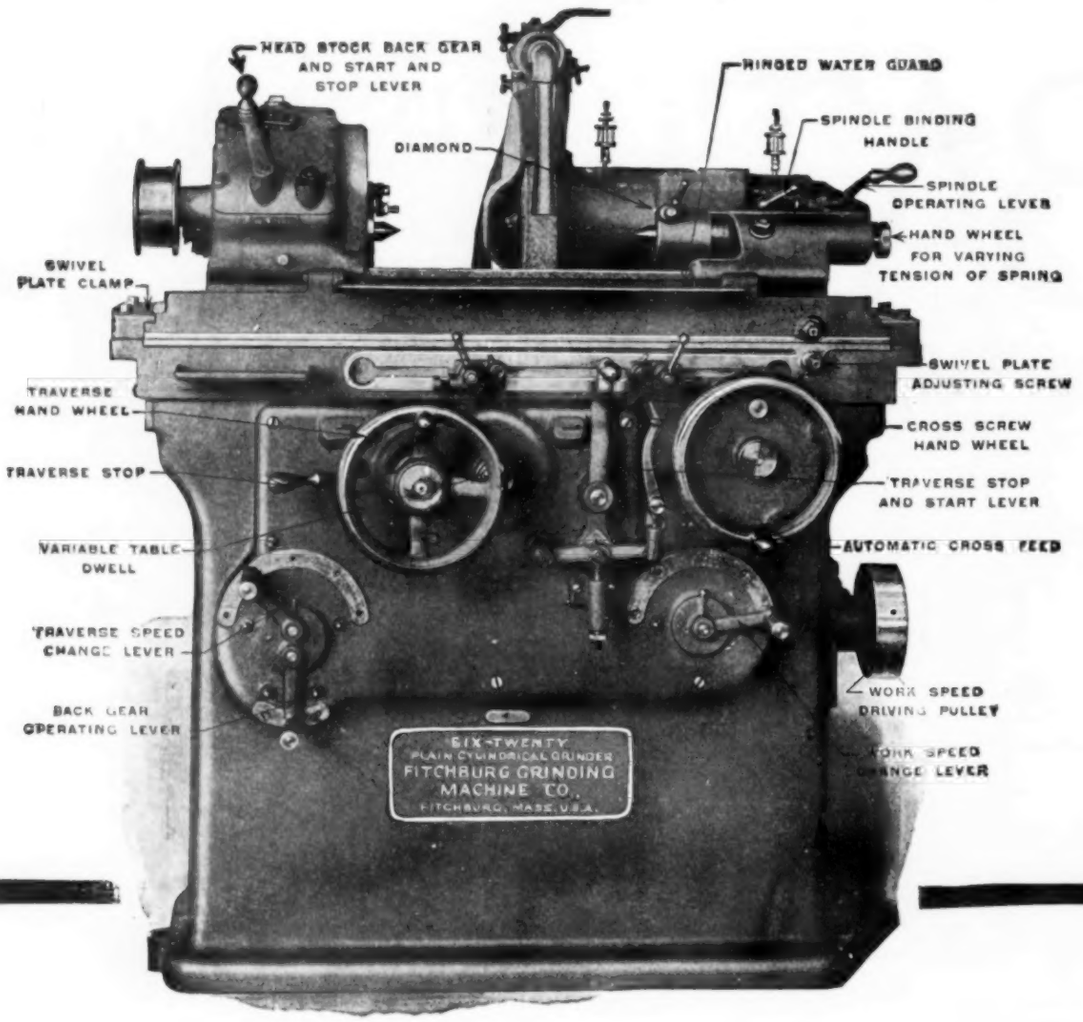
The Fairbanks Co., Albany.
The Fairbanks Co., Syracuse.
The Fairbanks Co., Utica.
The Fairbanks Co., Buffalo.
The Fairbanks Co., Boston.
The Fairbanks Co., Hartford.
The Fairbanks Co., Newark.
The Fairbanks Co., Philadelphia.
The Fairbanks Co., Scranton.
The Fairbanks Co., Baltimore.
The Fairbanks Co., Birmingham, Ala.
The Fairbanks Co., New Orleans.
The Fairbanks Co., New York City.
The Wolverine Machinery & Supply Co., Detroit.
The E. L. Essley Mchy. Co., Chicago.
The W. M. Pattison Supply Co., Cleveland.
The National Supply Co., Toledo.
Laughlin-Barney Mchy. Co., Pittsburgh.
American Machinery Syndicate, New York and Barcelona, Spain.
Hallidie Machinery Co., Seattle.
W. H. Savage, Fitchburg.
Alfred Herbert, Ltd., Coventry and Yokohama.
George E. Fogarty, Paris.
Oscar Ericsson, Copenhagen.

The Fitchburg 6 x 20

is carefully designed to meet the great variety of cylindrical grinding requirements. It will meet all the present day demands for accuracy and high speed production and, owing to its compact construction, occupies just half the floor space of the larger cumbersome machines. It is most rigid and powerful. Construction is on the unit system, each unit being entirely independent of any other and can quickly be removed from the machine. Lubrication throughout is designed to reduce wear and friction to a minimum.

Ask us for complete specifications on this machine.

Fitchburg Grinding Machine Co., Fitchburg, Mass., U. S. A.

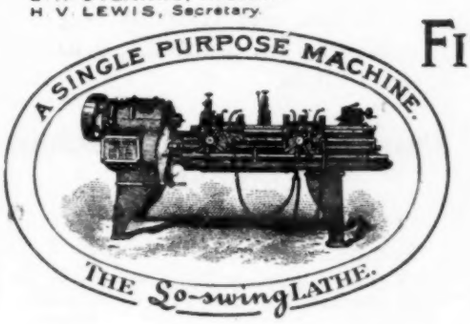


So-swing SERVICE

M. A. COOLIDGE, President.
L. M. WAITE, Vice President.
L. H. STEARNS, Treasurer.
H. V. LEWIS, Secretary.

Cable Address:
CHAPMAN, FITCHBURG.
LIEBER CODE.

ESTABLISHED 1864.
INCORPORATED 1899.



FITCHBURG MACHINE WORKS

MANUFACTURERS OF

THE So-swing LATHE.

FITCHBURG, MASS., U.S.A.
October 15, 1919.

Dear Sir:

During the war thousands of So-swings were installed, mostly in large batteries, for the production of materials urgently required by our Government. Now that we are at peace, some of these lathes must be absorbed by normal industries.

To any purchaser of such machines, whether he buys from us or from others, we promise our usual service. A line to us will bring a capable man from our own organization, competent to give practical advice upon tooling and operation of the So-swing.

Very truly yours,

FITCHBURG MACHINE WORKS.

M. A. Coolidge President.

HARTNESS AUTOMATIC DIE No. 9

As Used on the Potter & Johnston

This Die Represents our No. 9 Hartness Automatic Die, with floating shank adapted for use on the 6A Potter & Johnston machine. The capacity of this Die is from 1¾ in. to 3 in. diameter, 4 to 32 pitch.

AMERICAN AGENTS FOR DIES AND CHASERS:
Boyer-Campbell Co., Detroit; Carey Mchy. & Supply Co., Baltimore; E. I. Essley Mchy. Co., Chicago, Milwaukee and Moline; The E. A. Kinsey Co., Cincinnati, Indianapolis and Columbus, O.; Machinists Supply Co., Pittsburgh; The W. M. Pattison Supply Co., Cleveland; Robinson, Cary & Sands Co., St. Paul and Duluth; A. V. Wiggin Co., Syracuse, N. Y.; D. Nast Machinery Co., Bourse Bldg., Philadelphia, Pa.

FOREIGN AGENTS:
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Jones & Lamson Machine Company
(Automatic Die Department)
Springfield, Vermont, U. S. A.
109 Queen Victoria St., London, E. C.
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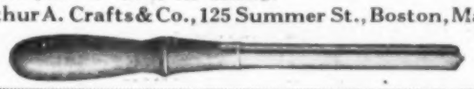
DIAMOND
Turning and Grinding Tools Made as You Want Them

Special Grinders furnished with either Diamond or Carbon points. Special nibs furnished from sketch or sample. African and Brazilian Diamond turning tools are particularly suited for turning hard rubber, fibre, bronze, copper, aluminum, or any hard, gritty material where steel tools fail.

Twenty-five years' experience, expert workmen and a host of satisfied customers deserve serious consideration by my prospective patrons. **Write for Catalog!**

Arthur A. Crafts & Co., 125 Summer St., Boston, Mass.



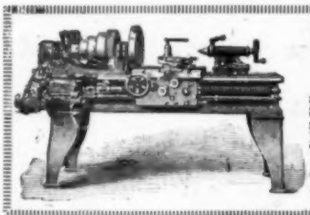
DIAMOND TOOLS

hold their cutting edges for months. Can easily be sharpened and will last for years. Leave a smooth, true and finished surface. These special shaped carbon, black diamond, pointed tools are best for turning paper, cotton, corn husk, rag, fibre, hard rubber, etc.

They turn out a large number of pieces of exact uniform size.

THOS. L. DICKINSON,
66 Nassau St. New York
(Successor to John Dickinson Estab. 1796)

C. W. Burton, Griffiths & Co., London, Sole Agents for Great Britain



ENGINES LATHES
10-12-14-16 and 18-inch Swing

any length Beds, Quick Change or New Standard. Countershaft or Motor Drive, and with or without Taper Attachment, Draw-in Attachment. Turrets, Chucks, Tools, etc., *Send for Catalogue.*

CHAMPION TOOL WORKS CO.
4957 Spring Grove Ave., Cincinnati, Ohio

"LENOX"
HACK SAWS—BAND SAWS

AMERICAN SAW & MFG. CO.
SPRINGFIELD, MASS, U.S.A.

Black Diamond Files & Rasps
Perfect Always

Twelve Medals Awarded at International Expositions

FOR SALE EVERYWHERE
Copy of Catalogue will be sent free to any interested file user on application

G. & H. BARNETT CO., PHILADELPHIA, PA.
Owned and Operated by the Nicholson File Co.

"WHITNEY" ROLLER CHAINS

For Motor Trucks, Tractors and Machinery

Cotter Detachable Type

Our chains are designed to meet the most severe and exacting requirements, and are manufactured in one of the most complete and modern plants by specialists who have made a study of chain making for years. Our chains are made from material chosen for quality and fitness regardless of cost, and the care taken in their manufacture makes them stand foremost. They have been adopted as standard equipment by the leading truck makers in America.

Convenience	Strength	Durability
Accuracy	Economy	Reputation

THE WHITNEY MFG. CO.

Hartford, Conn.

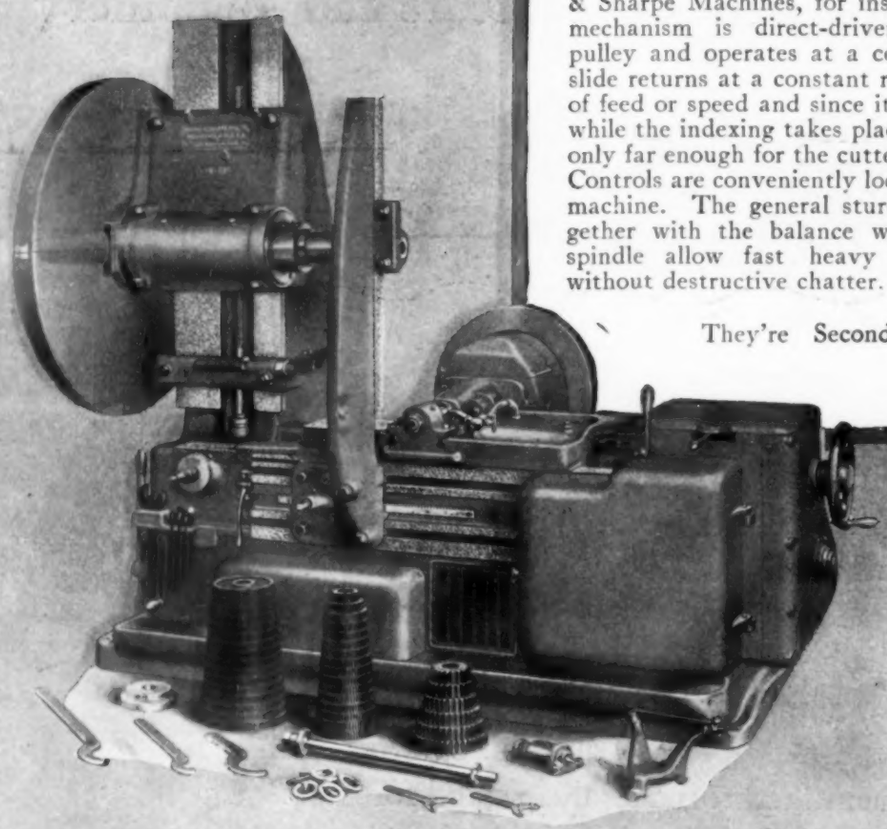
CHAINS KEYS AND CUTTERS HAND MILLING MACHINES

Foreign Agents: Burton Griffiths & Co., Ltd., London Fenwick, Freres & Co., Paris, France

Make the *Seconds* Work

Time saving features are numerous on Brown & Sharpe Machines, for instance: the indexing mechanism is direct-driven from the drive pulley and operates at a constant speed:—the slide returns at a constant rapid rate regardless of feed or speed and since it remains stationary while the indexing takes place, need be reversed only far enough for the cutter to clear the work. Controls are conveniently located at front of the machine. The general sturdy construction together with the balance wheel on the cutter spindle allow fast heavy cuts to be taken without destructive chatter.

They're Seconds Savers.

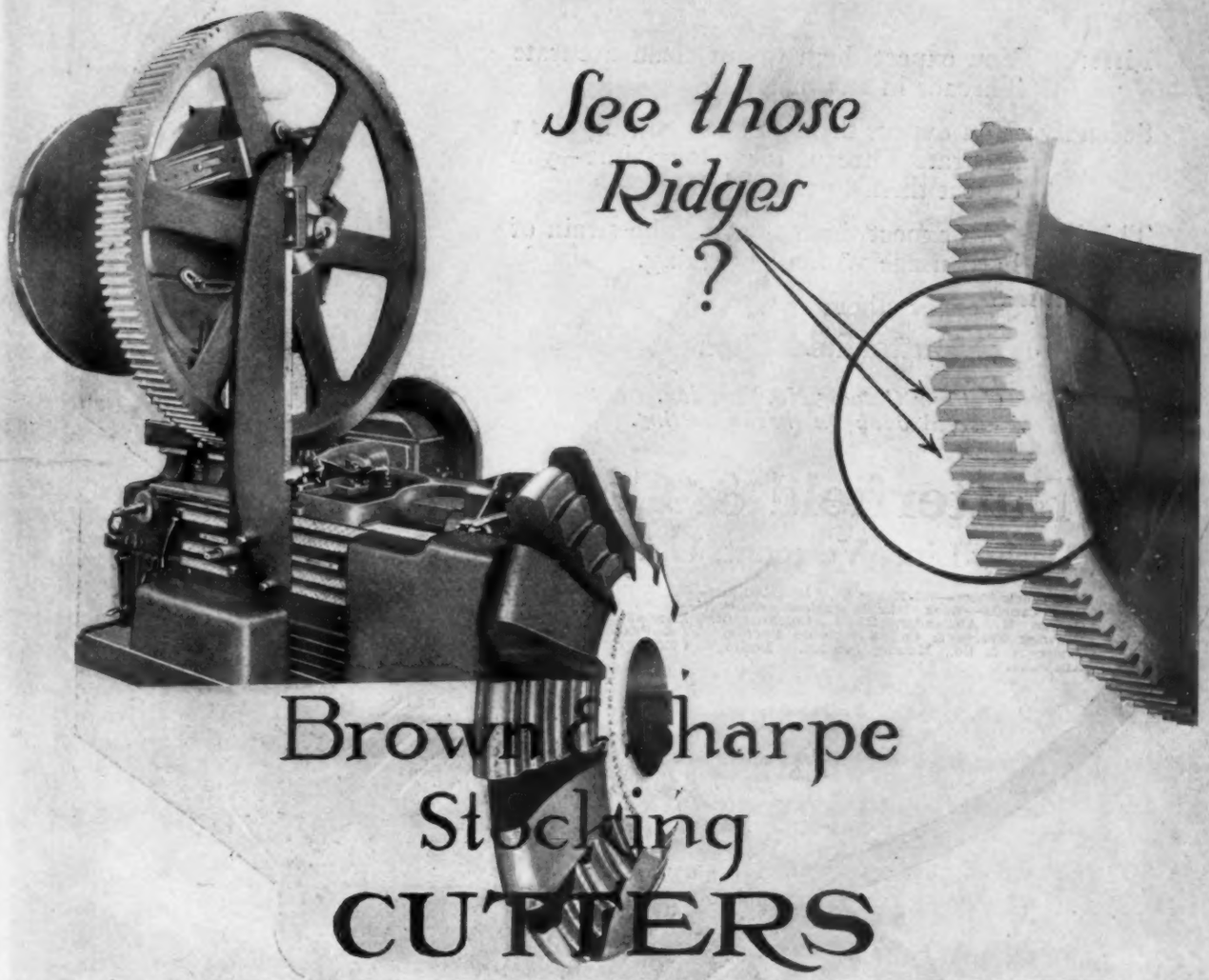


B·S TRADE MARK

Capacity:
Spur gears to 72 in. diameter, 13 in. face. Cast iron, 1¼ diametral pitch; steel, 2 diametral pitch.

BROWN & SHARPE
Automatic
Gear Cutting Machines
BROWN AND SHARPE
Providence

The Hours Care for Themselves



Brown & Sharpe Stocking CUTTERS

As shown by the photos very little stock remains to be removed by the finishing cutter and being in a series of ridges or steps, presents the minimum of resistance to the cutter.

The greater part of the cutting action is performed by the plain teeth, the stepped teeth projecting beyond them only enough to break up the chips. This permits the taking of heavy cuts at fast speeds and course feeds.

Results:—Greatly increased production, longer life for the cutters and a considerable saving in time otherwise spent in changing and sharpening cutters.

MANUFACTURING CO.,
Rhode Island.

What do you expect of the taps you buy?

First: You expect them to cut clean accurate Threads in any material.

Secondly: You expect them to keep cutting clean accurate Threads for a long time—you expect them to wear well.

Thirdly: You expect them to stand the strain of hard usage without breaking.

In short you expect them to be

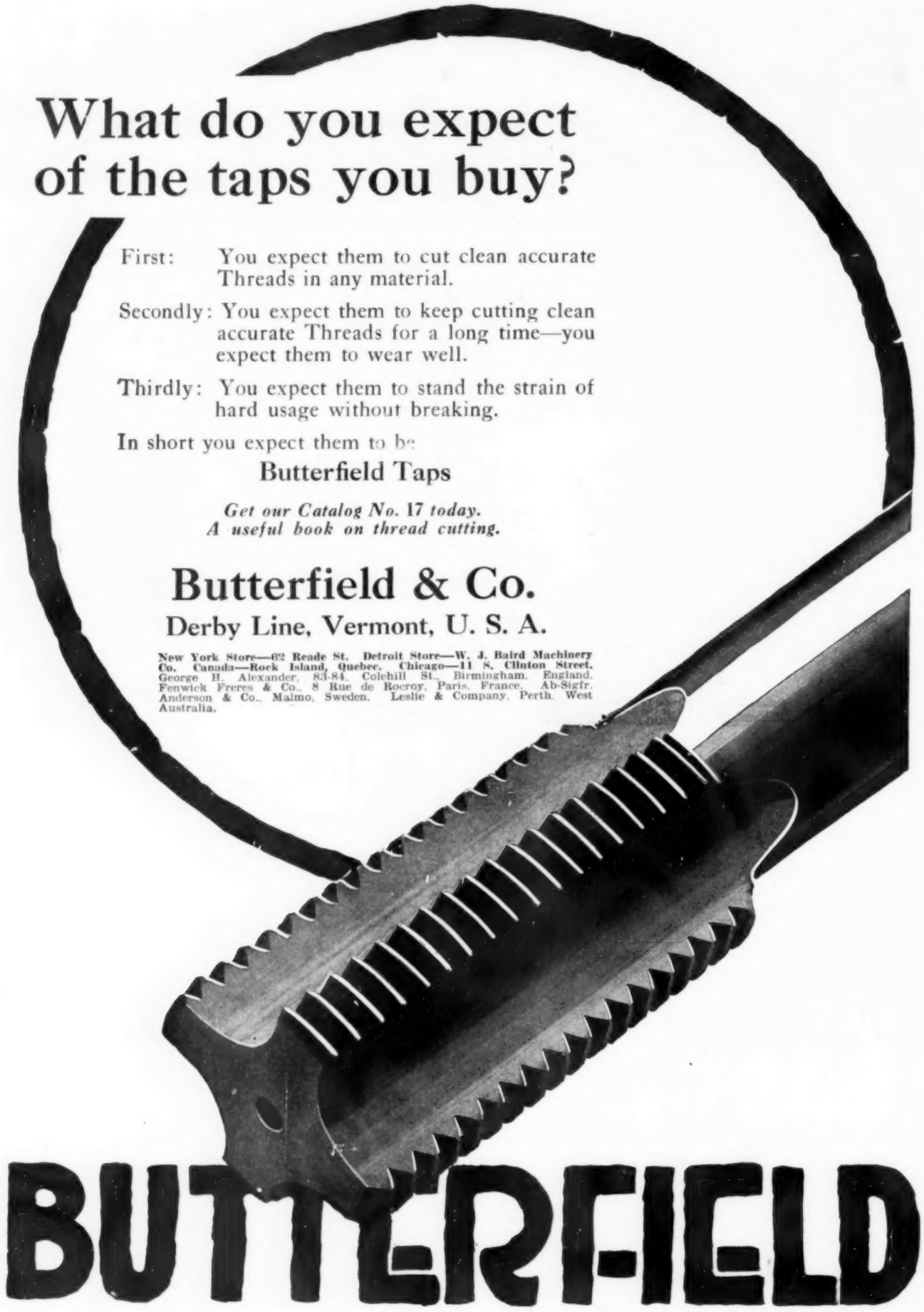
Butterfield Taps

Get our Catalog No. 17 today.
A useful book on thread cutting.

Butterfield & Co.

Derby Line, Vermont, U. S. A.

New York Store—62 Reade St. Detroit Store—W. J. Baird Machinery Co. Canada—Rock Island, Quebec. Chicago—11 S. Clinton Street. George H. Alexander, 83-84, Colehill St., Birmingham, England. Fenwick Freres & Co., 8 Rue de Rocroy, Paris, France. Ab-Sigfr. Anderson & Co., Malmo, Sweden. Leslie & Company, Perth, West Australia.



BUTTERFIELD

In the year to come, as never before, Industry will be the controlling factor in the affairs of this Nation ,,,,, And to Industry, now as always, The L·S·Starrett Co. acknowledges its indebtedness and reaffirms its policy of coop-eration through service.

42-7

Starrett Tools

NORTON

They Praise Both Its Accuracy and Production

This Norton Plain Cylindrical Grinding Machine was photographed in the plant of the Federal Bearings Company, Inc., Poughkeepsie, N. Y.

It is grinding the outer race for their "Number 410 Universal Annular Ball Bearing. The material is high carbon chrome-vanadium steel, hardened. The limits of accuracy are very close—half a thousandth. The work is held by a spring tension between a three-point contact rotating fixture and a true plate fastened to a rotating fixture in the tailstock.

Here's what the foreman said about this Norton: "It turns out very accurate work at the highest possible speed of production."

Ask us to mail you the Norton Bulletins.

NORTON COMPANY, Worcester, Mass.

NEW YORK STORE
151 Chambers St.

DETROIT STORE
73 W. Congress St.

CHICAGO STORE
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Outlasts Iron and Steel

50 to 1

A manufacturer using HARDITE annealing pots, carbonizing boxes, crucibles, cyanide pots, lead and the like can reasonably expect to get from 35 to 50 times the use out of such equipment over others made of iron or steel. The life of the average iron pot is about 180 hours. There are in use today annealing pots of HARDITE that have given over 6000 hours of actual service. On this basis, it is readily seen that HARDITE is ultimately very materially lower in cost than iron or steel.

HARDITE is noted for its unusual toughness and tensile strength. It will neither oxidize, carbonize, warp, corrode, scale or "grow". It is the superior heat and acid resisting alloy. Unaffected by corrosive producing agencies.

Ask us more about HARDITE—and if you are interested in the manufacture of acids and other corrosive agents, ask us about DENSITE and MERRITE as well.

HARDITE METALS, Inc.
3 Park Row, New York

Notes On Grinding
NORTON COMPANY WORCESTER, MASS.

No. 60 A

Cam Grinding—What Causes Cams to Show Softness After Grinding?

A frequent difficulty met with in cam grinding is a sequel to the effect produced in the use of too hard a wheel, which causes the face of the cam to crack or check. The difficulty is known to the operator as the softening of the cam and is usually charged by him to some defect or error in the machine attachment or method, whereas, as a matter of fact, in almost every case is due to carelessness in regulating the work speeds, the depths of cut or the grade of the wheel used.

By the best known methods of testing hardness, either by the Brinell meter or the scleroscope, when the proper speeds and grades of wheels have been used, there is no effect of softening that can be detected by such tests. This matter comes back to the same old difficulties in cam grinding, namely, that it is usually the common practice in finishing cams to use too hard a wheel, which, in order to act properly, causes the operator to take too deep a cut, which generates so much heat that the compound does not dissipate it fast enough and the temper in the cam is drawn slightly; or in the other case, when the other defect is noticed, the cheeks of the cams are checked or cracked. But when light cuts are taken and soft wheels used, these errors are entirely removed.

There is a knack in grinding cams which requires greater skill on the part of the operator than in most grinding operations. It is largely due to the fact that the cam is of an irregular shape and the action of the wheel at different points on the periphery of the cam varies, so that the operator has to use a great deal of care in adjusting other conditions, such as the speed of work, depth of cut, and flow of water to bring about the desired results.

NORTON COMPANY

Electric Furnace Plants: Niagara Falls, N. Y.; Chippawa, Ont.

New York Store: 151 Chambers Street
Detroit Store: 73-75 West Congress Street
Chicago Store: 11 No. Jefferson Street

DAVIS EXPANSION BORING TOOLS

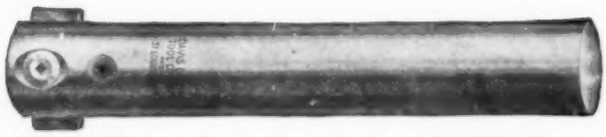
MATERIAL is too valuable, labor too scarce and current demands too urgent to warrant the use of unproductive tool equipment. A careful survey of metal boring operations in many shops would reveal a great waste of time and money (including some material loss), principally due to the use of faulty boring tools.

Davis Expansion Boring Tools solve the problem of conserving time and labor in metal boring, and savings in costs, ranging from 25% to 50% are assured with their use. Defective boring is also decreased to the minimum, for, when the cutters are set to size required and locked, they positively will not vary in size of bore. A practical micrometer adjustment expands the cutters to compensate for wear, and the simplicity and practical method of obtaining this expansion are the real features of Davis Expansion Boring Tools.

All metal boring operations in your shops should be performed with Davis Expansion Boring Tools. Advise us of your requirements and we will show the reason—"*WHY*"

Largest exclusive Manufacturers of Expansion Boring Tools and Expansion Reamers

Style "E" Tool for Turret Lathes



Style "V" Tool for Turret Lathes, Turret Boring Mills, Etc.

Style "O" Tool for Miscellaneous Work

DAVIS BORING TOOL COMPANY

3720 Forest Park Blvd. INCORPORATED St. Louis, Mo., U. S. A.

"And so I went to New London
J.N. LAPOINTE CO.
NEW LONDON
"Broaching—an opportunity to increase production"
J.N. LAPOINTE CO.
of NEW LONDON, CONN.
Makers of Broaching Machines and Broaches.
"Not skilled labor, but a skilfully designed broach"
J.N. LAPOINTE CO.
of NEW LONDON, CONN.
Makers of Broaching Machines and Broaches.
"Precise work requires precise tools"
J.N. LAPOINTE CO.
of NEW LONDON
"Broaching Does Good Work Cheaper—"
J.N. LAPOINTE CO.
of NEW LONDON, CONN.
Makers of Broaching Machines and Broaches.

Broaching practice and profit

NO MACHINING method has advanced more rapidly in importance in the past few years than broaching. The need for increased production emphasized the advantage broaching affords for higher speed and even greater accuracy in cutting, and gave it natural preference over older and slower methods.

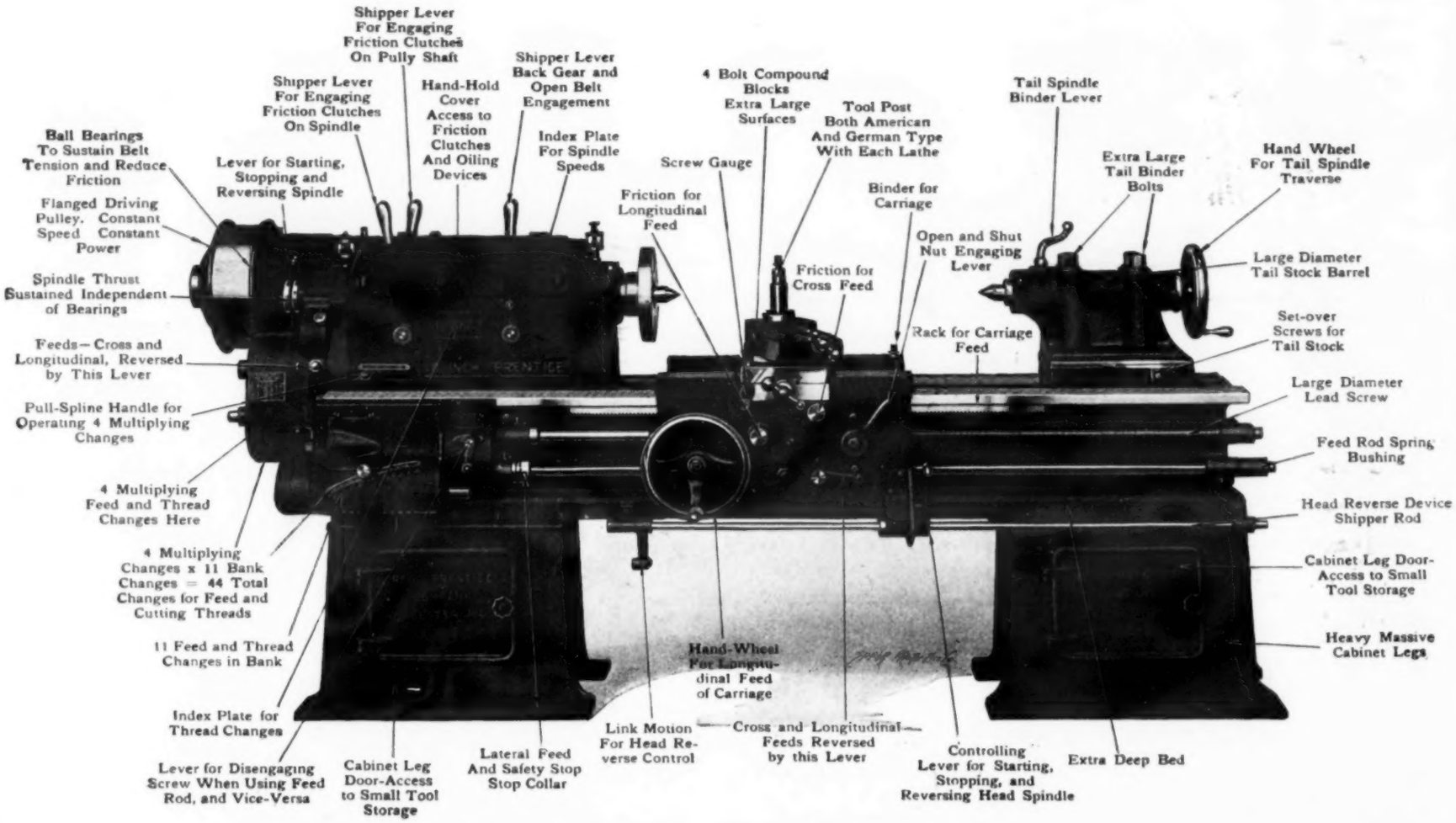
The increasing scarcity and cost of skilled labor has established broaching as the logical, and profitable, successor to quantity reaming and milling. Quality is maintained and greater production procured even at the hands of an operative of no more expertness than is required to start and stop the broaching machine.

Wider acquaintance with what broaching has done and can do would prove of distinct advantage to those manufacturers who are not already profiting by the use of broaching machines and broaches made by the

J.N. LAPOINTE CO. of NEW LONDON

2049-L

J.N. LAPOINTE CO.
of NEW LONDON, CONN.
Makers of Broaching Machines and Broaches.


Shipper Lever For Engaging Friction Clutches On Pully Shaft
Shipper Lever For Engaging Friction Clutches On Spindle
Hand-Hold Cover Access to Friction Clutches And Oiling Devices
Shipper Lever Back Gear and Open Belt Engagement
4 Bolt Compound Blocks Extra Large Surfaces
Tool Post Both American And German Type With Each Lathe
Tail Spindle Binder Lever
Ball Bearings To Sustain Belt Tension and Reduce Friction
Lever for Starting, Stopping and Reversing Spindle
Index Plate For Spindle Speeds
Screw Gauge
Extra Large Tail Binder Bolts
Hand Wheel For Tail Spindle Traverse
Flanged Driving Pulley. Constant Speed Constant Power
Friction for Longitudinal Feed
Binder for Carriage
Open and Shut Nut Engaging Lever
Large Diameter Tail Stock Barrel
Spindle Thrust Sustained Independent of Bearings
Friction for Cross Feed
Set-over Screws for Tail Stock
Feeds—Cross and Longitudinal, Reversed by This Lever
Rack for Carriage Feed
Large Diameter Lead Screw
Pull-Spline Handle for Operating 4 Multiplying Changes
Feed Rod Spring Bushing
4 Multiplying Feed and Thread Changes Here
Head Reverse Device Shipper Rod
4 Multiplying Changes x 11 Bank Changes = 44 Total Changes for Feed and Cutting Threads
Cabinet Leg Door-Access to Small Tool Storage
11 Feed and Thread Changes in Bank
Hand-Wheel For Longitudinal Feed of Carriage
Heavy Massive Cabinet Legs
Index Plate for Thread Changes
Link Motion For Head Reverse Control
Cross and Longitudinal Feeds Reversed by this Lever
Lever for Disengaging Screw When Using Feed Rod, and Vice-Versa
Cabinet Leg Door-Access to Small Tool Storage
Lateral Feed And Safety Stop Stop Collar
Controlling Lever for Starting, Stopping, and Reversing Head Spindle
Extra Deep Bed

18 INCH "PRENTICE" GEARED HEAD LATHE

REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.

A Geared Head Lathe

A "PRENTICE" LATHE OFFERS YOU MANY ADVANTAGES. IT WILL SAVE YOU—BELTS—LABOR—OVERHEAD—OIL—AND FLOOR SPACE, BESIDES LESSENING THE DANGER OF INJURY TO YOUR EMPLOYEES.

BECAUSE OF ITS HIGH EARNING CAPACITY THE PRICE DIFFERENCE BETWEEN IT AND A LATHE OF ANOTHER TYPE IS SOON CROSSED OFF YOUR BOOKS.

A "PRENTICE" LATHE CATALOGUE WILL BE GLADLY SENT UPON REQUEST.

MANNING, MAXWELL & MOORE, INC., NEW YORK
BOSTON, NEW HAVEN, PHILADELPHIA, WASHINGTON, BUFFALO, CLEVELAND, CINCINNATI, CHICAGO, ST. LOUIS, MILWAUKEE, SEATTLE, SAN FRANCISCO
DETROIT

CANADIAN FAIRBANKS-MORSE CO., LTD.
FENWICK FRERES

Slocco

This is our thirtieth Happy New Year

FOR an entire generation we have watched the machine tool business grow, year by year, to its present importance. In all this time Slocomb measuring devices have more than kept pace with growing demands for accurate measuring facilities.

Thirty years ago Slocomb Micrometers were pioneers in accurate measurement. Slocomb measuring devices of today still blaze the trail to speedier and more accurate measuring.

The Slocomb Catalog with the Measuring Book, is ready for you. Write for your copy.

J. T. Slocomb Company
Providence, Rhode Island, U. S. A.

Representative in Chicago: R. R. Street & Co., Machinery Hall.
Representative on Pacific Coast: Charles A. Dowd Sales Co., 330 Market St., San Francisco, Calif.
Representatives in England: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow.
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Representative in Japan: Alfred Herbert, Ltd., Yokohama.
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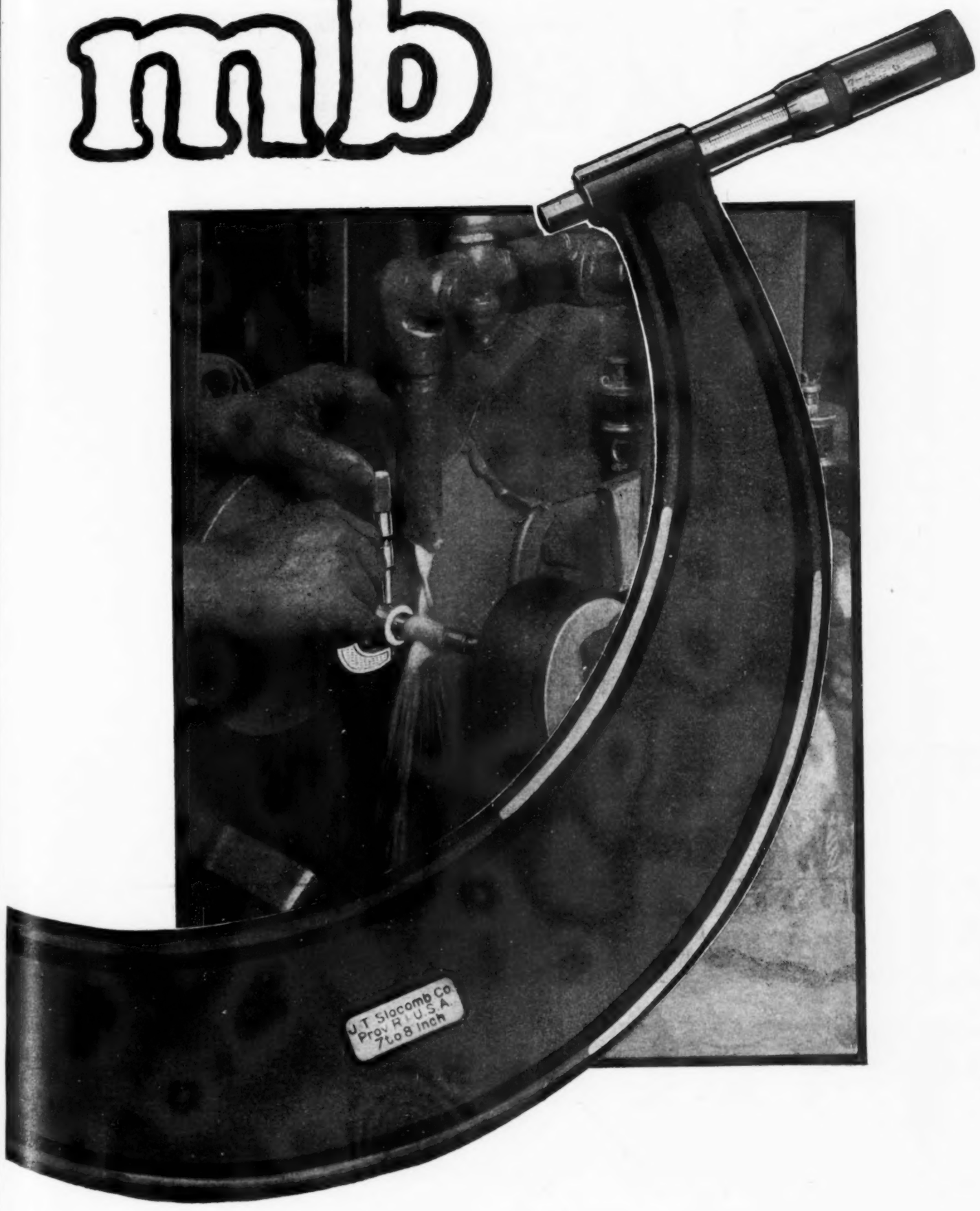


Speeding Production of Hardened

RIVETT

Steel Pieces with the No. 103

FOR high speed, close-limit, grinding on parts ranging in sizes from 1/64 to 2 in. diameter, this Rivett No. 103 internal Grinder is being found indispensable in hundreds of shops.

At the Northway Motor Company's plant at Natick, Mass., for example, this more-than-usual little machine is turning out hardened steel valve rolls to the tune of twenty per hour, average. The depth of the hole is 3/8 in. while the diameter is 7/16 in. The material is S. A. E.—10-20 Steel Hardened.

This No. 103 Rivett, by the way, is full automatic and is especially well adapted for small part manufacture as well as tool room and experimental work.

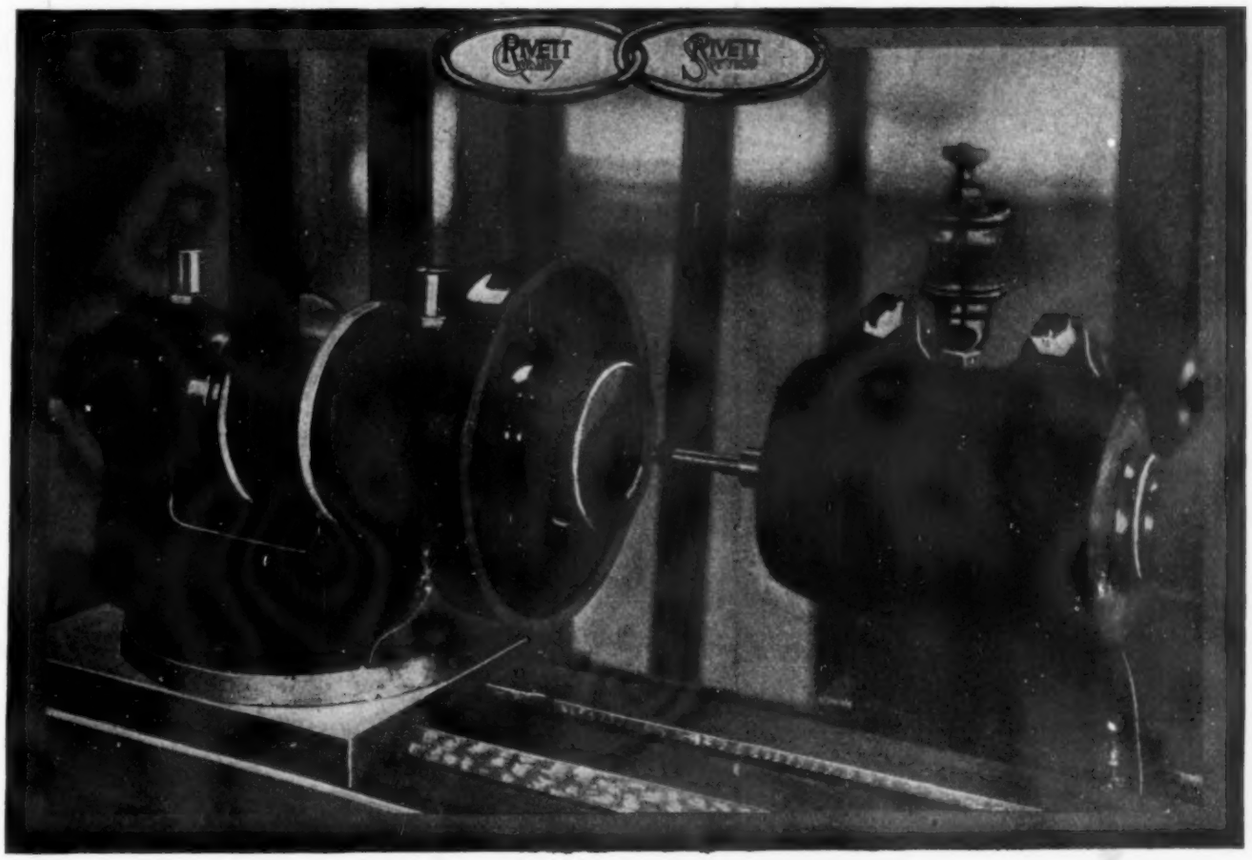
This machine has a maximum power operated table travel of 4 in. The standard machine includes the grinder proper, with water attachment, countershaft, foot control and the following accessories: a support for diamond holder; step-chuck closer ring; headstock holder wrench; six canvas spindle belts, and one can of special spindle oil.

You may obtain any Rivett Machine complete or any one or more of its parts and accessories at any Service Station shown on the next page.

For the complete list of dealers, see inside back cover.

RIVETT LATHE AND GRINDER COMPANY

Brighton District of Boston



SERVICE

Rivett Service Stations

CHICAGO, ILLINOIS

Machine Tools and Machinists' Supplies for immediate delivery.

We carry a complete stock of Rivett Machines and Accessories.

Dale-Brewster Machinery Company, Inc.
541-547 Washington Blvd.

BOSTON, MASS. and PROVIDENCE, R. I.

We carry Machine Tools of every description, Power Transmission, Engines, Pumps and other Power outfits, Trucks and Wheelbarrows, Scales, Valves, Automobile and Service Station Equipment, Mill, Mine and Railway Supplies and Specialties. We carry a stock of Rivett Machines, Attachments and Accessories.

The Fairbanks Company

ST. LOUIS, MISSOURI

We represent the Rivett Lathe and Grinder Company and carry a stock of their machines. We are in position to furnish a complete assortment of high-grade machines and shop equipment.

Blackman-Hill-McKee Machinery Co.
1513 North Broadway

SEATTLE, WASHINGTON

We represent and carry in stock the products of the leading machine tool manufacturers in the United States as is evidenced by our carrying a stock of Rivett Machines, Attachments and Accessories.

Hallidie Machinery Company

LONDON, GLASGOW, MANCHESTER, SHEFFIELD AND BIRMINGHAM

We carry a full line of the Rivett Lathe and Grinder Company's machine tools. We specialize in machine shop equipment and accessories.

Buck & Hickman

CINCINNATI, OHIO
INDIANAPOLIS, IND.

We carry a complete line of machine tools for prompt delivery. We also carry a stock of Rivett Machines, Attachments and Accessories.

The E. A. Kinsey Co.

CLEVELAND, OHIO

We stock a complete line of High Grade Machine Tools including Rivett Machines, Attachments and Accessories.

The Cleveland Tool & Supply Co.

PHILADELPHIA, PA.

We have in stock for instant delivery, one each Cleveland High Power All-Geared Plain and Universal Milling Machines. We carry a stock of Rivett Machines, Attachments and Accessories.

D. Nast Machinery Co.

Rivett Lathe and Grinder Company, Bric

NEW YORK, NEW YORK

We are agents for the Champion Tool Works, Lathes, Mulliner Tool Room Lathes. We carry a stock of Rivett Machines, Attachments and Accessories.

Patterson, Gottfried & Hunter, Inc.

DETROIT, MICHIGAN

At 997 Woodward Ave. we maintain a showroom for the display of metal working machinery in general and particularly we carry a stock of Rivett Machines, Attachments and Accessories.

J. R. Stone Tool & Supply Co.

TORONTO, CANADA

We represent in Canada the leading manufacturers of High Grade Machine Tools. We carry a stock of Rivett Machines, Attachments and Accessories.

H. W. Petrie, Limited

STOCKHOLM, SWEDEN

High grade machine tools and machine shop equipment our specialty. A full line of Rivett Lathes and Grinders, Attachments and Accessories always in stock.

A. B. Galco, Ltd.

HARTFORD, CONN.

We are local distributors for Monarch Engine Lathes, Ohio Planers and Shapers, Abrasive Surface Grinders. We carry a complete line of machine tools as well as a stock of Rivett Machines, Attachments and Accessories.

Purinton & Smith

ROCHESTER, N. Y.
ALBANY, SYRACUSE, BUFFALO

We are agents for Hamilton Engine Lathes, G. A. Gray Co. Planers, Kempsmith Milling Machines, Fosdick Radial Drills. In addition to the above we carry a stock of Rivett Machines, Attachments and Accessories.

Homer Strong

FRANCE, BELGIUM, ITALY
SPAIN and PORTUGAL

We carry a full line of Rivett Lathe and Grinder Company's Machine Tools and Attachments, and offer you our services in their connection.

Fenwick Freres & Co.
Paris, France

PITTSBURGH, PA.

Bradford Lathes, Fosdick Radials, Kempsmith Millers and a score of others go to make up our big line of quality tools.

The Rivett Line is one of our latest and best acquisitions. Our stock is open for your inspection.

Somers, Fitler & Todd Co.

Rivett Service Stations—exactly! Just as the automobile user makes use of the Automobile Service Station so the user of the Rivett Lathe or Grinder takes advantage of the Rivett Service Stations.

Look over this list. Every Service Station on these pages can give you information and instructions regarding the particulars of Rivett Precision Lathe and Rivett Internal and Radial Grinders; can demonstrate to you the high efficiency of Rivett products and can offer anything in the line of Rivett accessories and supplies.

Select the Service Station nearest you—and learn the latest news on Rivett Quality Products.

hton District of Boston

Bunting

Trade Mark
REG. B. R. & B. CO.

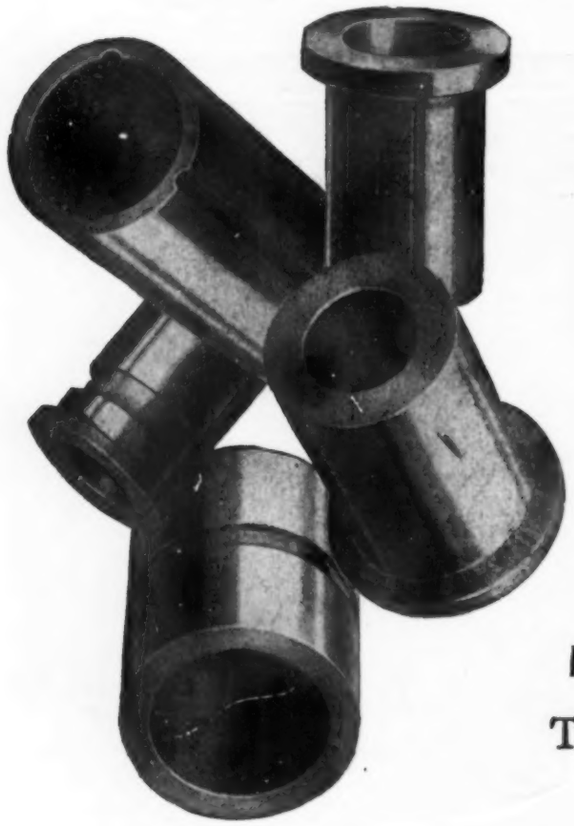
We Emphasize the Quality

....of....

Bunting Bushings

Finished Bronze Bushings from the Bunting Plant have a record for uniformity, accuracy, excellency of finish, and wearing quality.

Manufacturers buying Bunting Bushings avoid the high cost and losses due to pattern making, defective castings and machining errors which always figure large when a machinery manufacturer buys his own castings and machines them.



When you buy Bunting Finished Bushings you know the exact cost of each perfect bushing with no losses in imperfect stock to account for.

You get the advantages we provide by our pattern and tool equipment of over 10,000 designs, the benefits of our highly developed machinery operations, the service of our ever watchful chemists and metallurgists who keep our alloy compositions and casting processes up to a positive, never varying standard.

Ask us for quotations on your bushing requirements

The Bunting Brass & Bronze Co.
735 Spencer Street, Toledo, Ohio

Bunting Bushings

Wear Longer Because a Patented Process makes the Grain Harder

We now supply 134 sizes in Straight-Dimension Finished Bronze Bushings from "Stock."

This service gives everyone the advantage of quicker shipment—orders ordinarily filled the day received.

It gives the small order, as well as the large, a price advantage not possible previously.

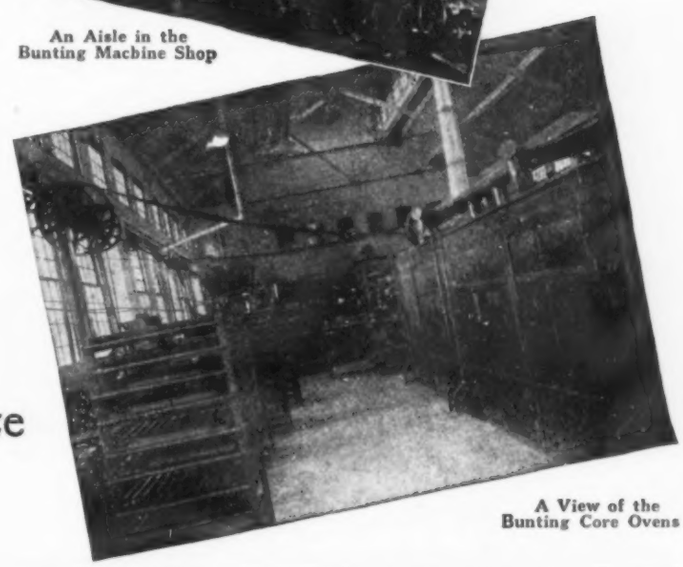
Ask for Stock List "S"—you will probably find many sizes you can use without change. In other instances, you can by slightly changing your dimensions, meet our standards, and embrace the benefits of this service.

The Bunting Brass & Bronze Company

735 Spencer S reet, Toledo, Ohio

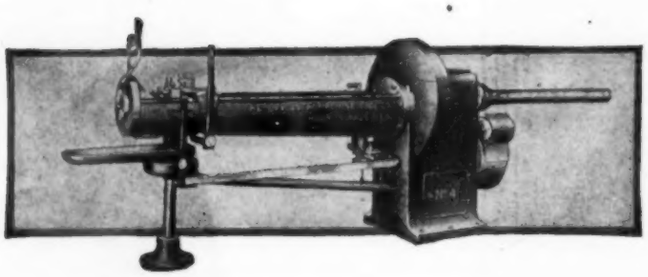
A Battery of Bunting Furnaces

An Aisle in the Bunting Machine Shop



A View of the Bunting Core Ovens

To You an



The originator of
Commercial Broaching

Lapointe 07

d Yours

Lapointe of Hudson sincerely hopes that Santa Claus treated you mighty fine this Christmas and wishes you the best of Luck and the greatest prosperity throughout the coming year.

Hudson

This company is maintaining a staff of engineers of unusually broad experience.

The business of this Engineering Staff is to cooperate with your engineers to obtain the best and most comprehensive results in your heat treating plant.

It is not the business of these engineers to advocate the installation of any individual equipment which does not increase the total overall efficiency of the heat treating plant.

We have heat treating equipment to sell but we believe it can best be sold on the basis that its installation is consistent with the best combined results which can be obtained from the entire plant.

If you believe engineering worked out on this basis will be of interest to you write us and the services of our engineering staff are at your disposal.

The American Incandescent Heat Company, Inc.

Furnace Builders under the Smallwood Patents

10 Post Office Square, Boston, Mass., U. S. A.

Stewart Oven Furnaces

Get Quantity Production and Highest Quality

HEAT TREATING operations in modern industrial plants demand dependable equipment. Particularly is this true with material the character or uses of which make it important that the products of combustion do not come in direct contact with the metal, and that a uniform temperature be maintained for an indefinite period.

Stewart Oven Furnaces meet these requirements thoroughly. They are very successful in tool and die hardening, case hardening, annealing and tempering. Several types will handle high speed steel with economy and accurate results.

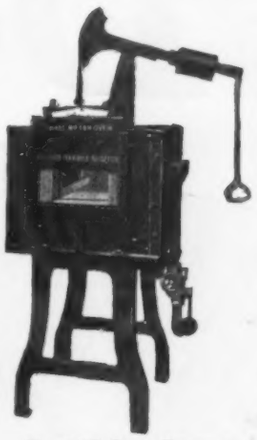
Desired temperatures are reached quickly and steadily, and held as long as necessary. Combustion takes place beneath the hearth, and the flame surges over it and into the arch of the furnace with maximum fuel efficiency. In no case does the flame strike the work direct. The placing of burners makes possible an even, economical fuel supply, and a uniform distribution of heat in all parts of chamber. Temperature is under instant and absolute control of the furnace man at all times.

Linings are of high-refractory fire clay of unusual thickness—heat radiation is practically eliminated. Other materials entering into furnace construction are the best we can obtain, and are of known quality and dependability.

Stewart Oven Furnaces are strongly and compactly built, and their sturdy construction enables them to endure hard usage and meet unusual heat treating demands day after day. Seven sizes are shown—there are many others.

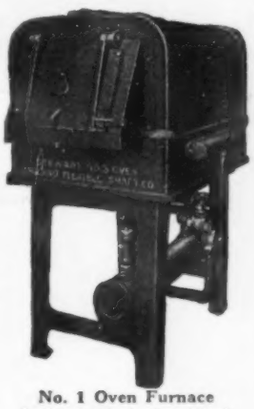
There's a Stewart for every heat treating need.
Send for the Catalog.

No. 28 Oven Furnace
Indirect Heat, for Hardening High Speed or Carbon Steel or for Annealing and Carbonizing U-shaped bottom slab. Opening 4-in. x 8-in., depth 12-in. For gas only.



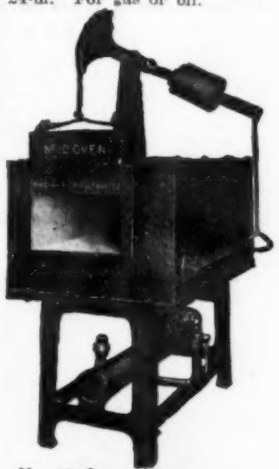
No. 14H Oven Furnace
Indirect and Direct Heat, under and over fed. For High Speed Steel. U-shaped bottom slab. Opening 6-in. x 10-in., depth 15-in. For gas only.

No. 3 Oven Furnace
Indirect Heat, for Annealing, Re-heating, Tool Hardening and Case Hardening in small boxes. Flat bottom slab. Opening 9-in. x 15-in., depth 24-in. For gas or oil.



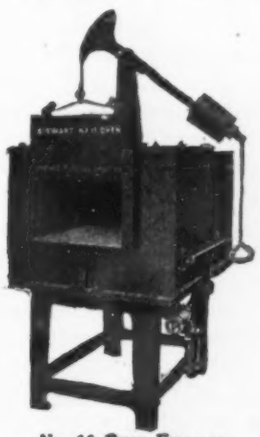
No. 1 Oven Furnace
Indirect Heat, for Hardening High Speed or Carbon Steel or for Annealing and Carbonizing U-shaped bottom slab. Opening 5-in. x 9-in., depth 13½-in. For gas or oil.

Chicago Flexible Shaft Company
1156 South Central Ave., Chicago



No. 10 Oven Furnace
Indirect Heat, for Heat Treating, Annealing and Carbonizing Flat bottom slab. Opening 12-in. x 20-in., depth 48-in. For gas or oil.

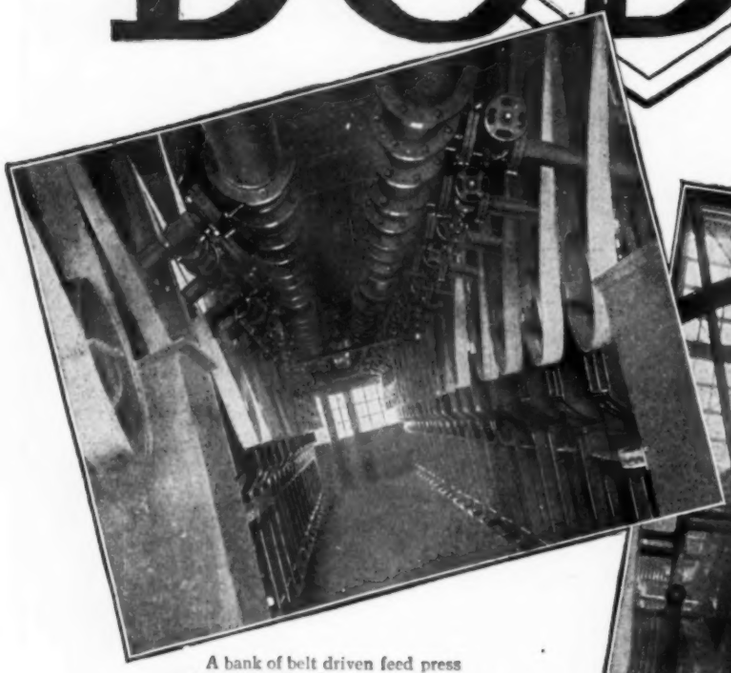
No. 25 Oven Furnace
Indirect Heat, for Annealing and Carbonizing. Flat bottom slab. Opening 14-in. x 22-in., depth 60-in. For gas or oil—large capacity furnace.



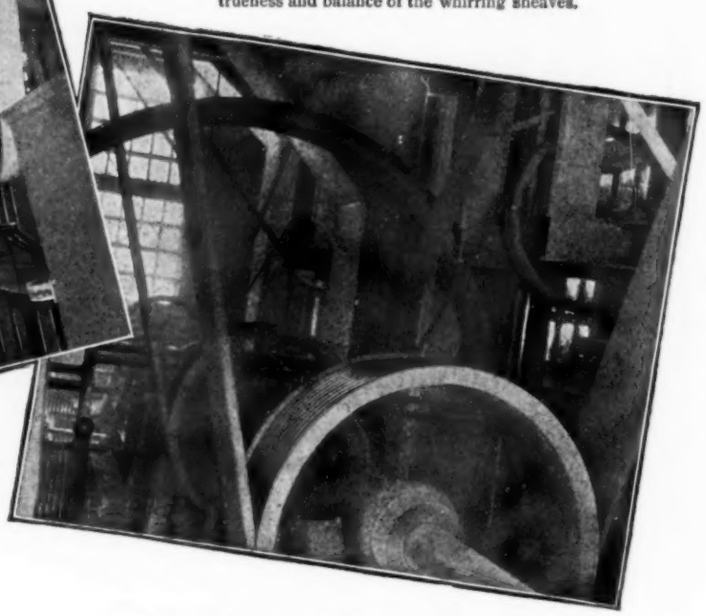
No. 11 Oven Furnace
For Annealing, Carbonizing, Pre-heating or Re-heating. Special cork brick insulation. Opening 12-in. x 20-in., depth 36-in. For gas or oil.

DODGE

The Corn Products Refining Company uses Dodge Equipment throughout their entire plant. The view below is an unretouched photograph of a jack shaft in motion—note the trueness and balance of the whirring sheaves.



A bank of belt driven feed press conveyors—the above view is a time exposure unretouched. Dodge quality is plainly evident.



Big production calls for Dodge

Dodge facilities for making and shipping large quantities of stock goods and for filling promptly and accurately orders for special machinery make Dodge equipment almost a necessity for large power transmission installations.

Engineers whose reputations depend upon the efficiency of the transmission equipment they recommend are coming more and more to appreciate the advantage of having every piece of machinery manufactured and guaranteed by one maker—and that maker the largest in the world.

Only in the Dodge plant will you find facilities for making the correct machinery for every transmission requirement—bearings for shafts of 21 inches or more diameter, and pulleys 28 feet in diameter.

Whether you want a single collar or a complete power transmission installation, Dodge facilities insure the greatest efficiency and durability. The large and more intricate the specifications, the more likely Dodge will get the order.

Dodge Products are distributed by Dodge, Oneida, and Keystone dealers in every important city. They will deliver what you want, when you want it.

The new Dodge catalog is ready. Shall we send your copy?

Are you reading The Dodge Idea?

Some important industrial articles are appearing monthly. Tell us to put your name on the mailing list.

Dodge Branch Warehouses:

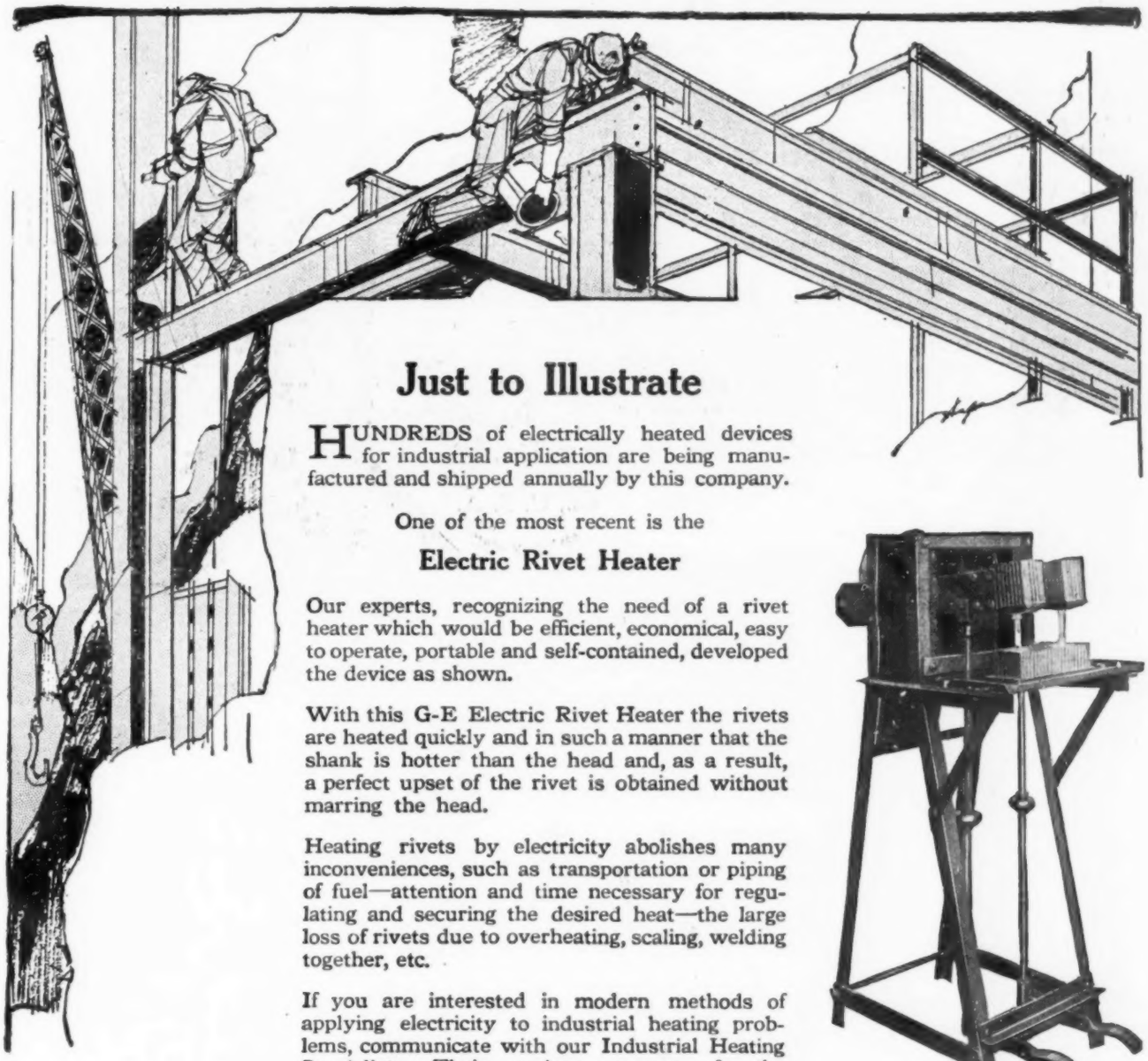
Philadelphia	315 Arch St.
Cincinnati	118 W. Third St.
New York	21 Murray St.
Chicago	208 S. Clinton St.
St. Louis	408 N. Fourth St.
Boston	137 Purchase St.
Atlanta	20 S. Forsyth St.
Pittsburgh	237 Second Ave.
Minneapolis	100 N. Third St.
Dallas	Gt. Southern Life Bldg.
Providence	171 Pine St.
Seattle	522 First Ave., So.
Newark	281 Market St.

Dodge Sales and Engineering Co.

Distributor of the Products of Dodge Manufacturing Company

General Offices and Works: Mishawaka, Indiana

The fortunate fact that nature provided for the transformation of electric energy into heat is rapidly securing world-wide appreciation



Just to Illustrate

HUNDREDS of electrically heated devices for industrial application are being manufactured and shipped annually by this company.

One of the most recent is the

Electric Rivet Heater

Our experts, recognizing the need of a rivet heater which would be efficient, economical, easy to operate, portable and self-contained, developed the device as shown.

With this G-E Electric Rivet Heater the rivets are heated quickly and in such a manner that the shank is hotter than the head and, as a result, a perfect upset of the rivet is obtained without marring the head.

Heating rivets by electricity abolishes many inconveniences, such as transportation or piping of fuel—attention and time necessary for regulating and securing the desired heat—the large loss of rivets due to overheating, scaling, welding together, etc.

If you are interested in modern methods of applying electricity to industrial heating problems, communicate with our Industrial Heating Specialists. Their services are yours for the asking.

General Electric Company

General Office Schenectady, N.Y.

39-14

Gilbert & Barker

Self-Measuring Pumps and Tanks

have stopped the waste of oil and are saving time and labor at

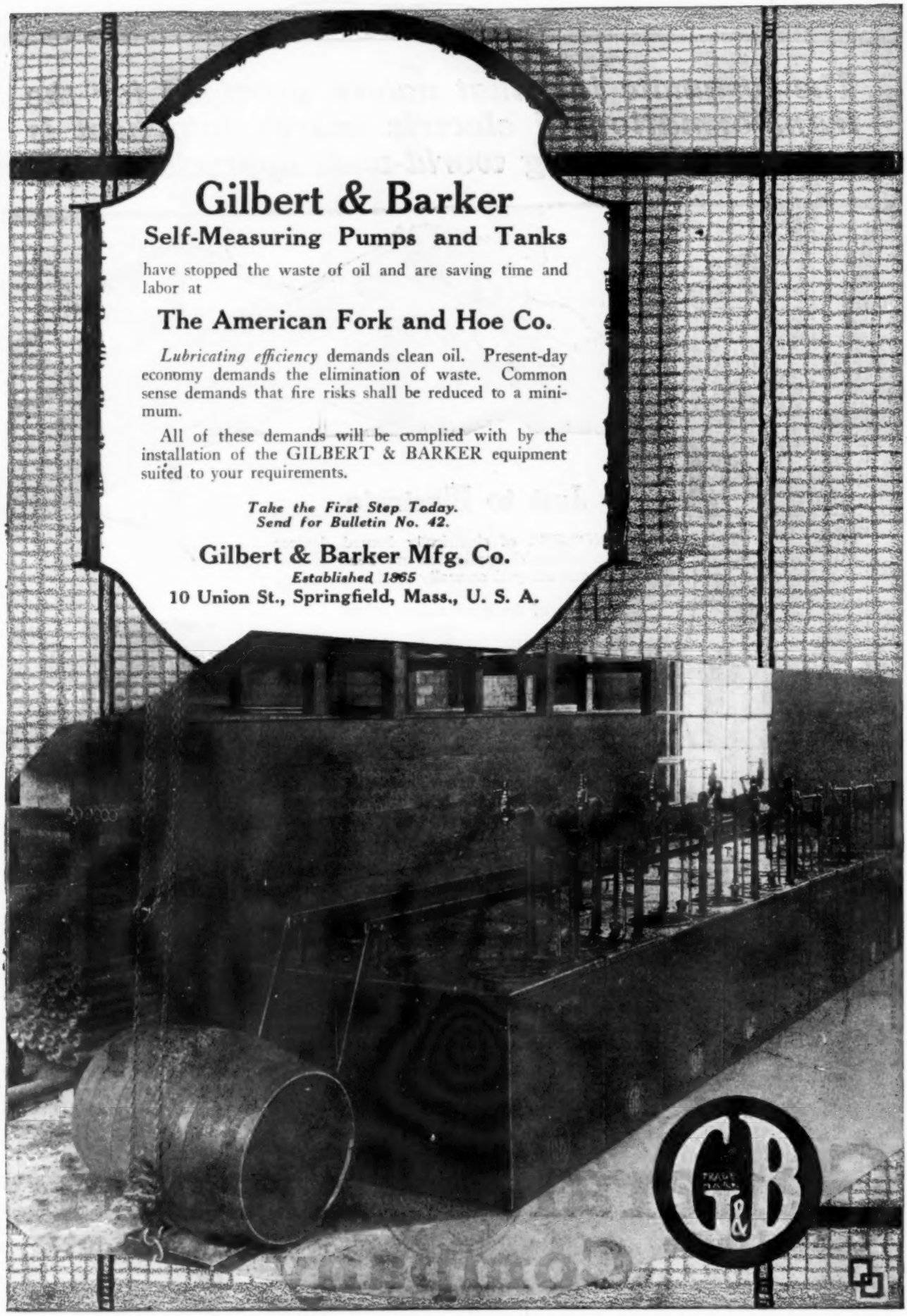
The American Fork and Hoe Co.

Lubricating efficiency demands clean oil. Present-day economy demands the elimination of waste. Common sense demands that fire risks shall be reduced to a minimum.

All of these demands will be complied with by the installation of the GILBERT & BARKER equipment suited to your requirements.

Take the First Step Today.
Send for Bulletin No. 42.

Gilbert & Barker Mfg. Co.
Established 1865
10 Union St., Springfield, Mass., U. S. A.



This indicator is set to locate the correct printing position

The Card is inserted in this card receiver

Job Time Records

The only way to obtain economical accuracy, is to make its attainment simple, easy, quick and sure. That is what has been done in this International Cost Recorder for recording Job Time.

Any form of job card can be used with this International Cost Recorder, and the printing is so spaced as to make it particularly adaptable to the use of the Hollerith Tabulating Card.

EMPLOYEE NO. 1450
ORDER NO. 16980
PART NO. 1786 | OPERATION 12
FINISHED NOV 21 4.7 | STARTED NOV 21 1.2 | PIECES GOOD 54
HOURS 3.5 | RATE .55 | AMOU $1.9
J.B.m. SIGNED

12 Mo. | Name Frank Morgan | Date 11-21-19 | Dept. 14.

	Day	Yr	Employee No.	Dept.	Order No.	Part No.	Oper.	Pieces Good	Hours	Earnings
10	0 0	20	0 0 0 ●	● 0 0	0 0 0 0 ●	● 0	0 0 0	0 0	● ● 0	● 0 0
1	1 ●	21	● 1 1 1	● 1	● 1					

NO. 47 NAME Charles Williams DEPT. NO. 3

	TIME RECORD	ELAPSED TIME		ORDER NO.	DESCRIPTION OF WORK
8	1919 NOV 21 5.0	1.5	Finish	2681	Gear cutting
7	1919 NOV 21 3.5		Start		
6	1919 NOV 21 3.5	3.4	Finish	2371	Grinding
5	1919 NOV 21 11.1		Start		Milling
4	1919 NOV 21 11.1	1.9	Finish	3168	
3	1919 NOV 21 9.2		Start		Gear cutting
2	1919 NOV 21 9.2	1.7	Finish	3351	
1	1919 NOV 21 7.5		Start		

TOTAL E. T. 8.5 RATE .60 COST $5.10 APPROVED H.R.

Write us for details on the special advantages of the International Cost Recorder. You will have our prompt and practical cooperation.

INTERNATIONAL TIME RECORDING COMPANY of New York

Works: Endicott, N. Y. Toronto, Ontario, Canada

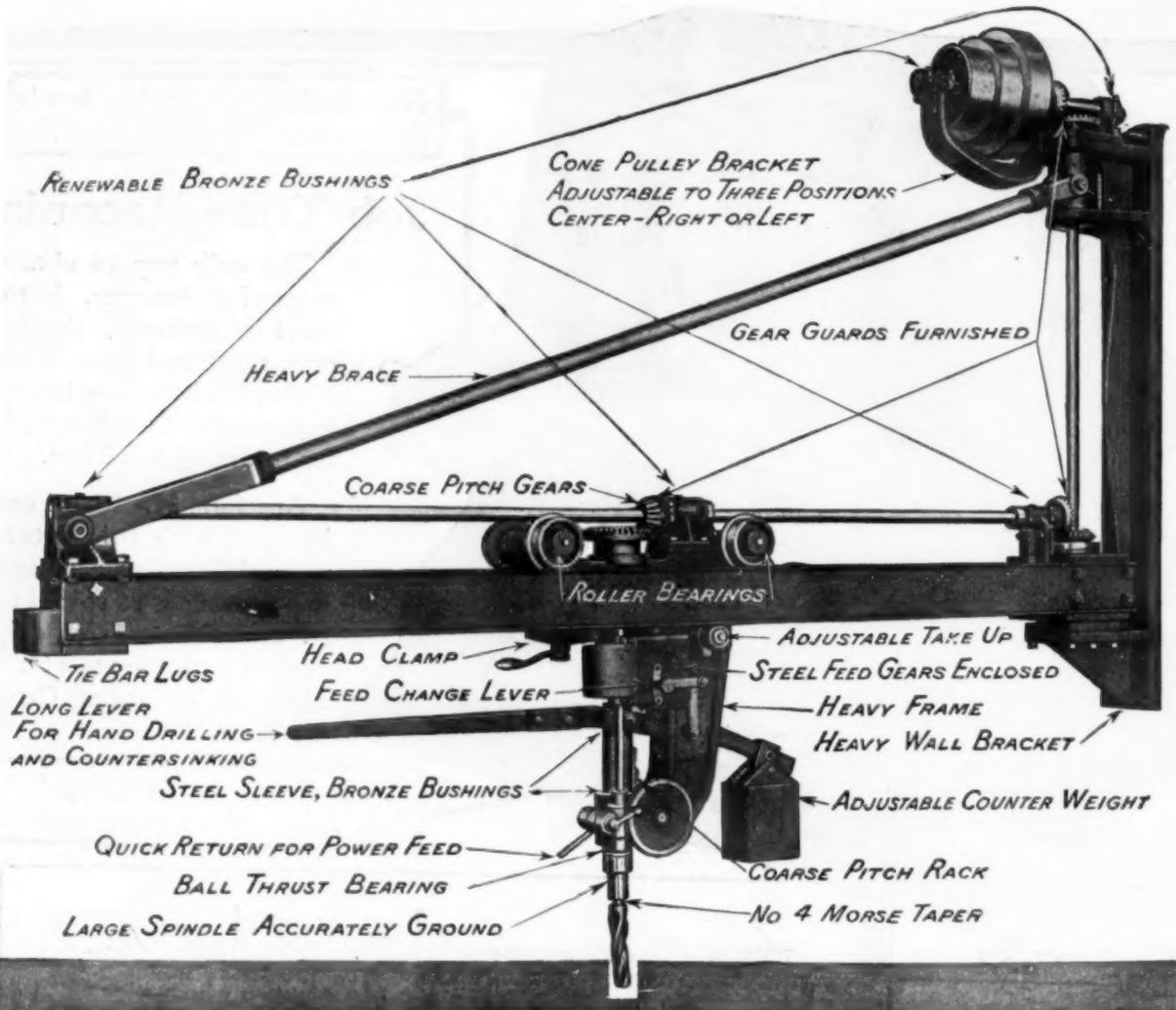
Offices and Service Stations in all principal cities of the world

General Offices: 50 Broad Street New York

Canadian Office: International Business Machines Co., Ltd. 300 Campbell Avenue, Toronto, Canada

London Office: 57 City Road, Finsbury London, E. C., England

Paris Office: 77 Avenue de la Republique Paris, France



Faster and More Convenient Drilling

That is what you can get with the Lynd-Farquhar Wall Radial Drilling Machine. It has a much wider range than the ordinary radial. The head moves with extreme ease from end to end of the arm.

This is a real machine too, carefully designed, and made from the best materials.

The entire control of the

LYND-FARQUHAR Wall Radial Drilling Machine

is within easy reach of the operator. The hand lever feed is nicely counter-balanced by an adjustable weight for light drilling and countersinking, and can be adjusted to remain in any position. An eccentric wheel on the underside of the arm keeps the carriage in proper adjustment along the channels.

Made in four standard sizes:

Size	Drills of Center of	Wall to End of Arm	Net Weight lbs.
7 ft.	14 ft. circle	10 ft. 4 in.	3380
9 ft.	18 ft. circle	12 ft. 4 in.	3483
11 ft.	22 ft. circle	14 ft. 4 in.	3615
13 ft.	26 ft. circle	16 ft. 4 in.	3750

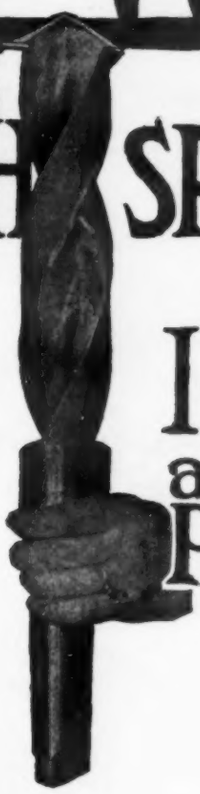
Special lengths of arms to suit requirements can be furnished. Get the rest of the story.

Write us for it.

LYND-FARQUHAR CO., Boston, Massachusetts

Latrobe

HIGH SPEED DRILLS



Inspection assures Perfection

DUE to extreme care used in their manufacture, **Latrobe** Drills and Reamers would still lead all others, even though they were not inspected; nevertheless, the **Latrobe** Ideal is so high that the element of chance is entirely eliminated, and every Drill and Reamer of this make is rigorously inspected, not once, but many times, and by different inspectors, to make sure that it measures up to the **Latrobe** standard of 100% accuracy. Yet Inspection is only one of the factors which make **Latrobe** Drills superior.

Latrobe Drills have all the strength of the forged Drill plus the accuracy of the milled Drill.

LOOK FOR THE NAME **Latrobe** ON THE SHANK

LATROBE TOOL CO.

MANUFACTURERS

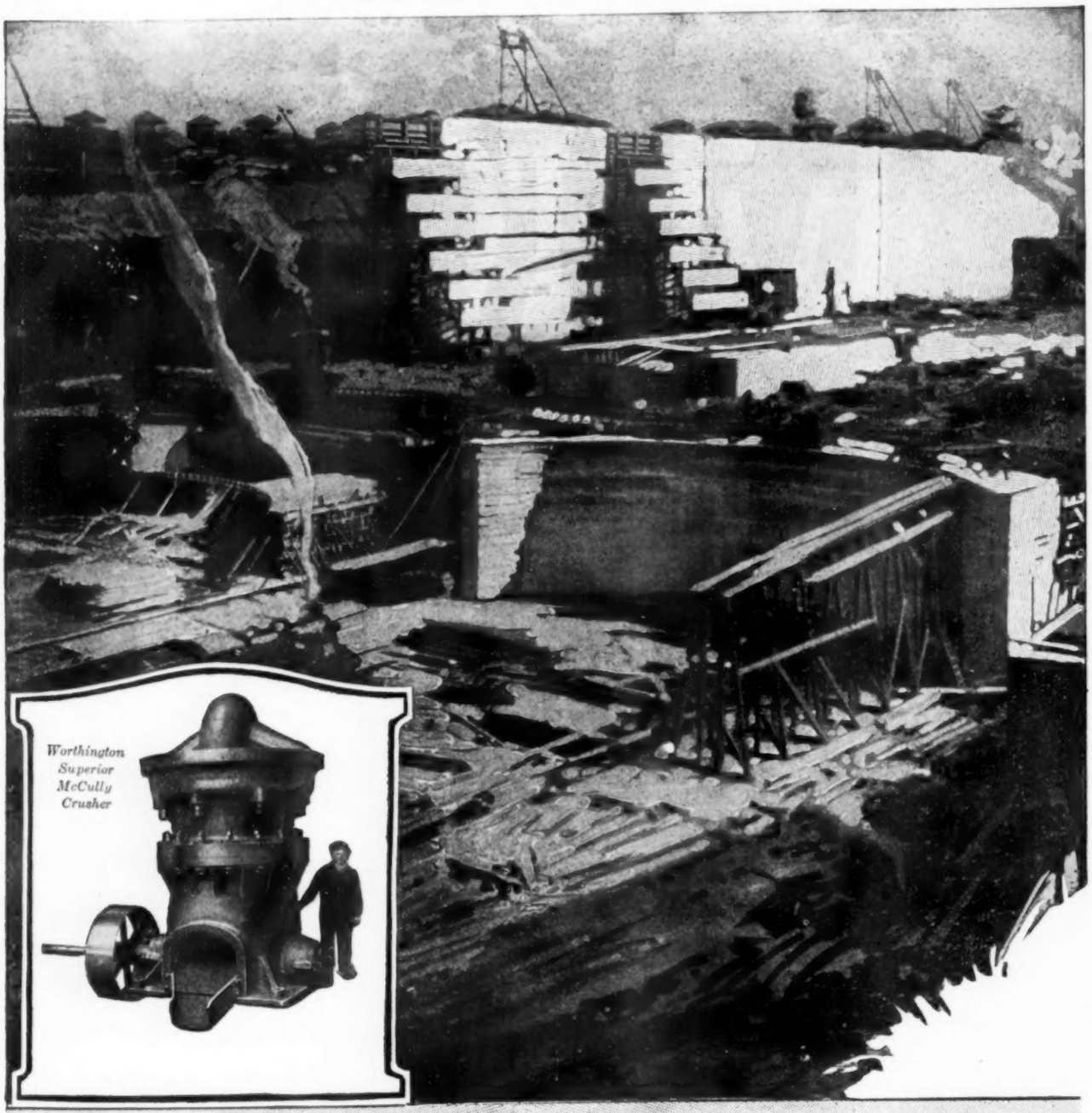
LATROBE, PENNA.

COMPLETE STOCKS AT

Factory Latrobe, Pa. | 566-568 W. Randolph St. Chicago, Ill. | 312 Lincoln Bldg. Detroit, Mich. | 41 N. Sixth St. Philadelphia, Pa.

The hot rolling of this special high speed steel section compresses the steel in the center, therefore when the drill is twisted the toughest portion is in the exact center.

FOUR FLUTE SPIRAL REAMER



PUMPS–COMPRESSORS–CONDENSERS–OIL & GAS ENGINES–

WORTHINGTON

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Harrison, N. J.
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Deane Works
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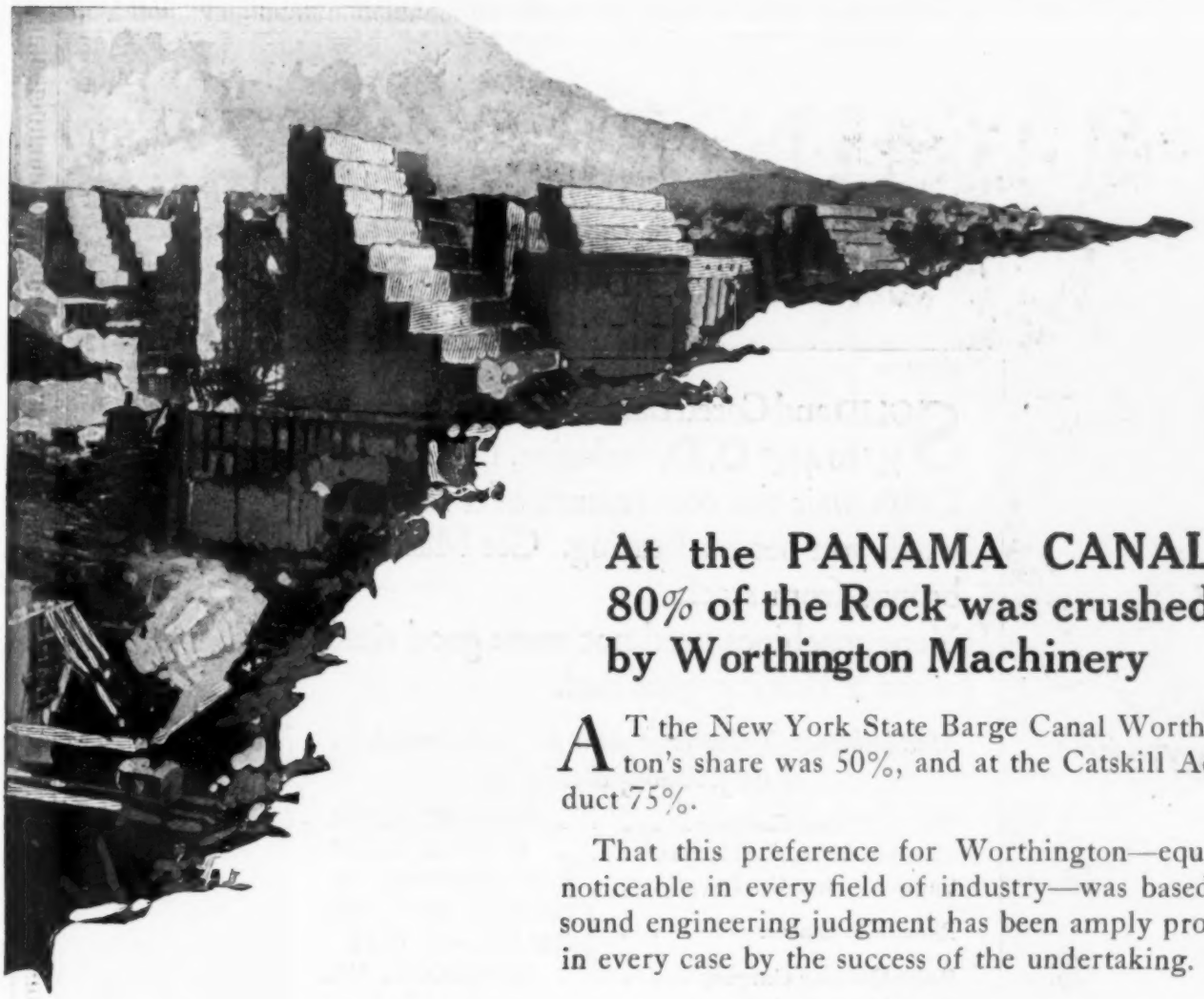

At the PANAMA CANAL 80% of the Rock was crushed by Worthington Machinery

AT the New York State Barge Canal Worthington's share was 50%, and at the Catskill Aqueduct 75%.

That this preference for Worthington—equally noticeable in every field of industry—was based on sound engineering judgment has been amply proved in every case by the success of the undertaking.

WORTHINGTON PUMP AND MACHINERY CORPORATION
***Executive Offices:* 115 Broadway, New York City**
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-METERS-MINING-ROCK CRUSHING & CEMENT MACHINERY

WORTHINGTON

Snow-Holly Works
Buffalo, N. Y.
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Power & Mining Works
Cudahy, Wis.
Gas Engine Works
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MACHINEBRONZE

FOR AUTOMOBILE AND MACHINERY
CONSTRUCTION AND REPAIR

SOLID and Cored Bars in 12″ lengths from ½″ to 4½″ O. D. inclusive, by eighths. Don't wait the convenience of a foundry when you need a Bearing. Get Machinebronze from stock.

Your machines need not waste good time when a Bearing goes bad.

Machinebronze is always in stock for your convenience at the following distributors:

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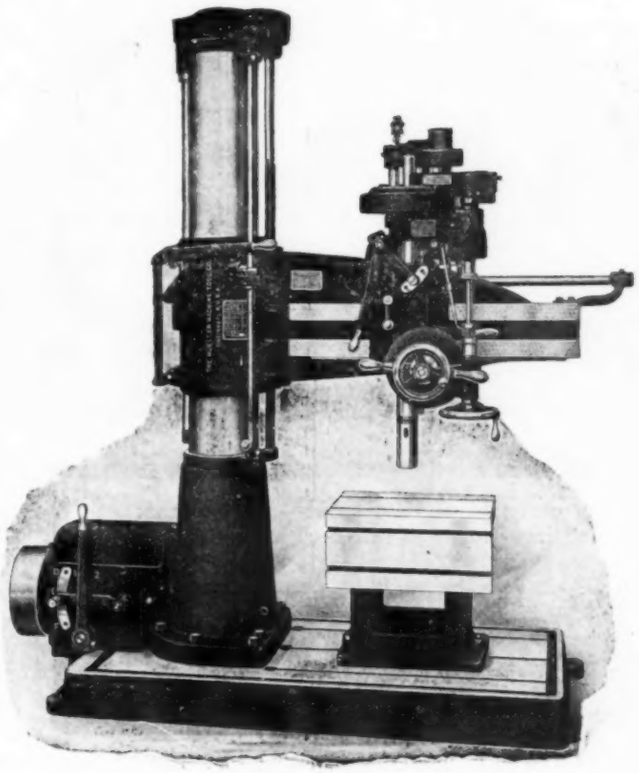
Machinebronze is guaranteed free from melting and molding defects.

LUMEN BEARING COMPANY

BRASS FOUNDERS
BUFFALO



You Can't Drive a Spike With a Tack Hammer

AND, by the same token, you cannot do an accurate job of heavy machining with a tool that has a weak back bone. The column of the Mueller Radial Drill is of one-piece internal webbed construction. It will never spring nor vibrate under any test a drill can put up to it. It delivers the same accuracy when the arm is at the top of the column as when at its lowest point. That is why the

MUELLER RADIAL DRILL

is demanded by modern manufacturers. The bearing surface of the column is ground to size and an ample width of arm bearing further enhances rigidity. Ask any manufacturer about Mueller performance under stress—he will give you more details than our literature, but send for it anyway.

The Mueller Machine Tool Co.

Radial Drills and Lathes

Established 1902 **Cincinnati, Ohio**

National Cleveland

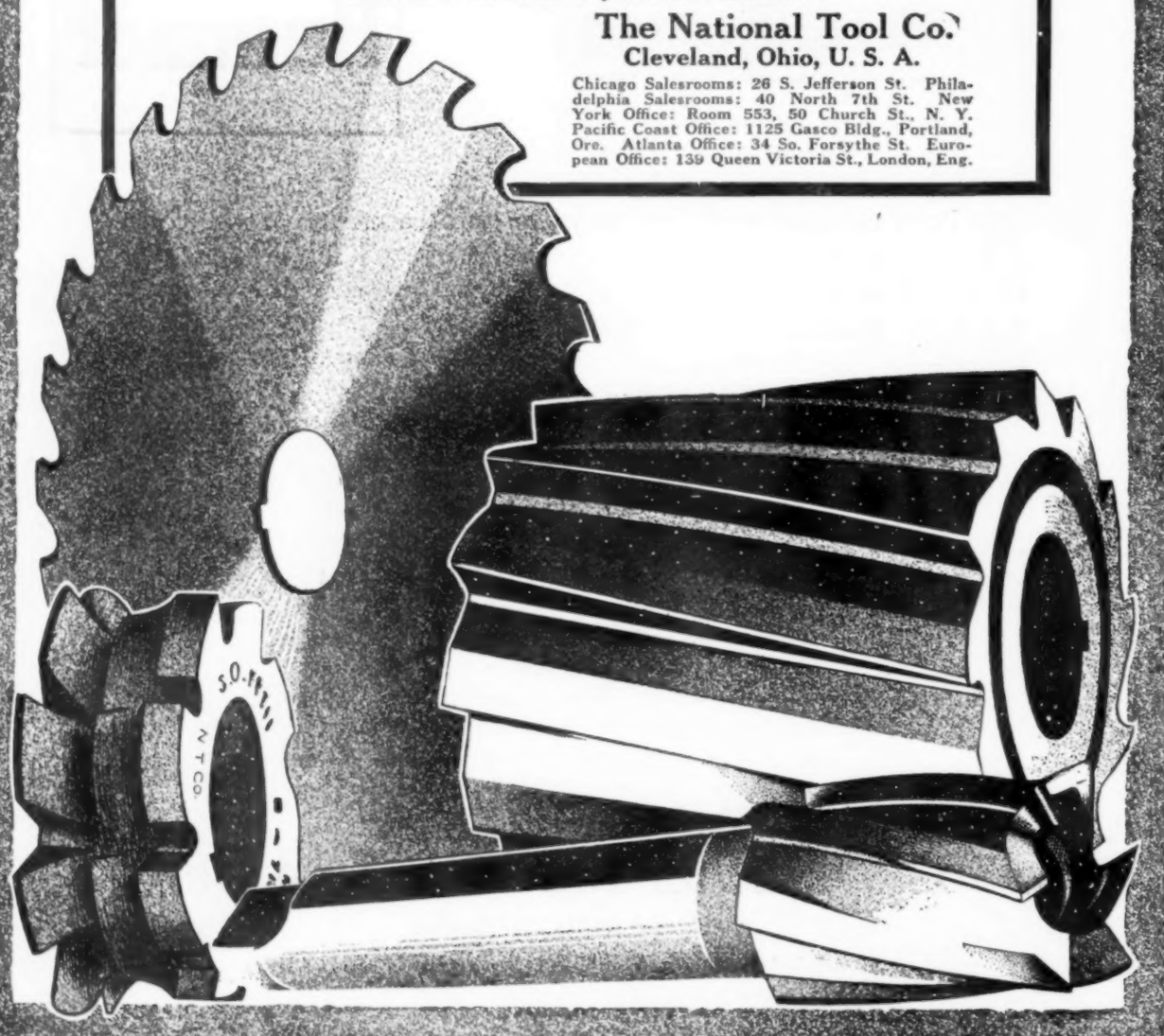
For cutters and tools that will answer every demand for speed—for tools that will "stand up" through long periods of time—for tools that need little attention insist on National Cleveland.

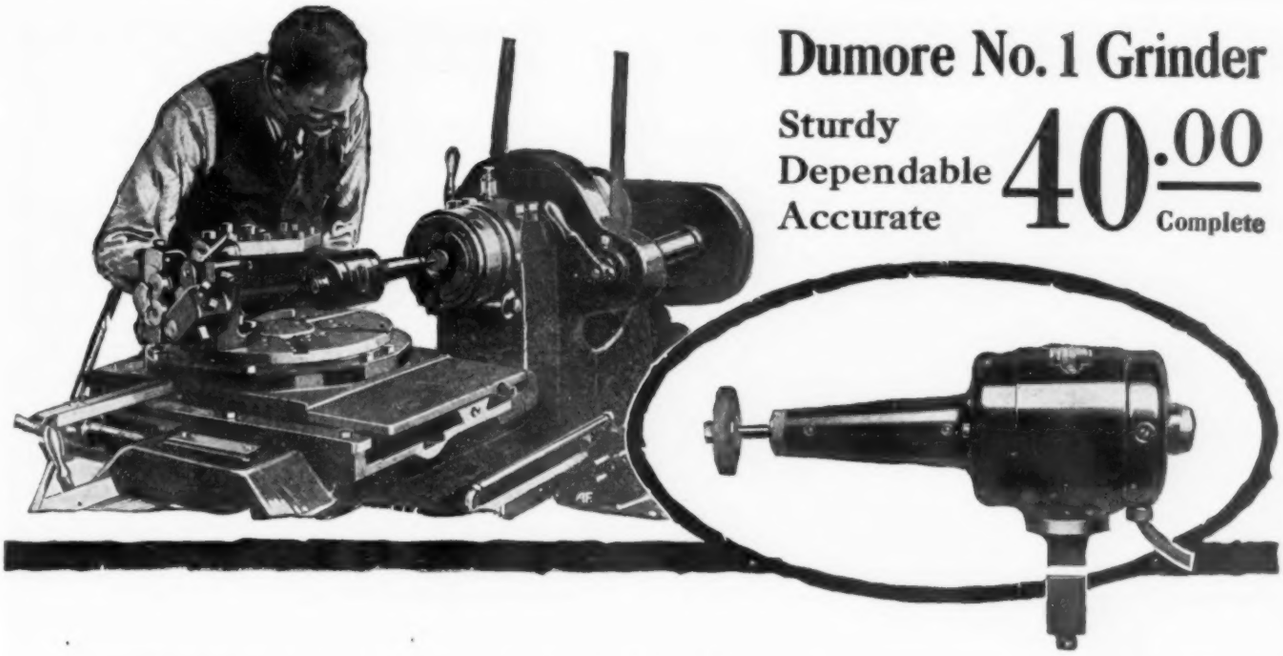
Are you receiving our monthly stock list? If not you better let us list your name. It may help you get a rush order.

Ask us to mail it to you each month.

The National Tool Co.
Cleveland, Ohio, U. S. A.

Chicago Salesrooms: 26 S. Jefferson St. Philadelphia Salesrooms: 40 North 7th St. New York Office: Room 553, 50 Church St., N. Y. Pacific Coast Office: 1125 Gasco Bldg., Portland, Ore. Atlanta Office: 34 So. Forsythe St. European Office: 139 Queen Victoria St., London, Eng.





Dumore No. 1 Grinder

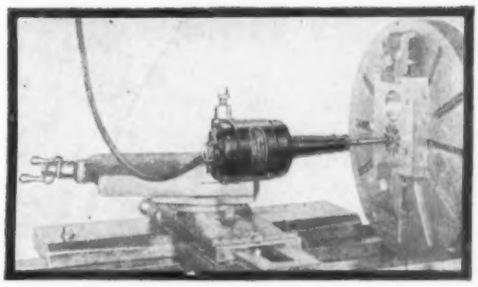
Sturdy
Dependable
Accurate

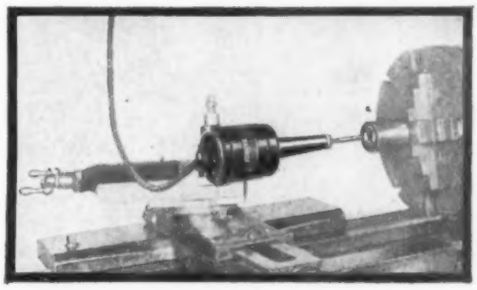
40.00 Complete

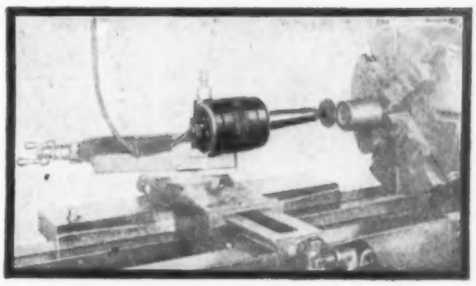
THERE is no doubt of the value of the **Dumore No. 1 Grinder.** No other tool, at or anywhere near its price, can give a greater amount of actual, accurate daily service.

Because jigs, dies, gages, bushings, etc., will always warp during tempering, thousands of mechanics use the **Dumore** grinder to bring these tools to as close limits as .0001″. Such a degree of accuracy is possible solely because the **Dumore** is perfectly balanced throughout and operates at the correct cutting speed.

We have some very interesting literature for men facing grinding problems —write for it.

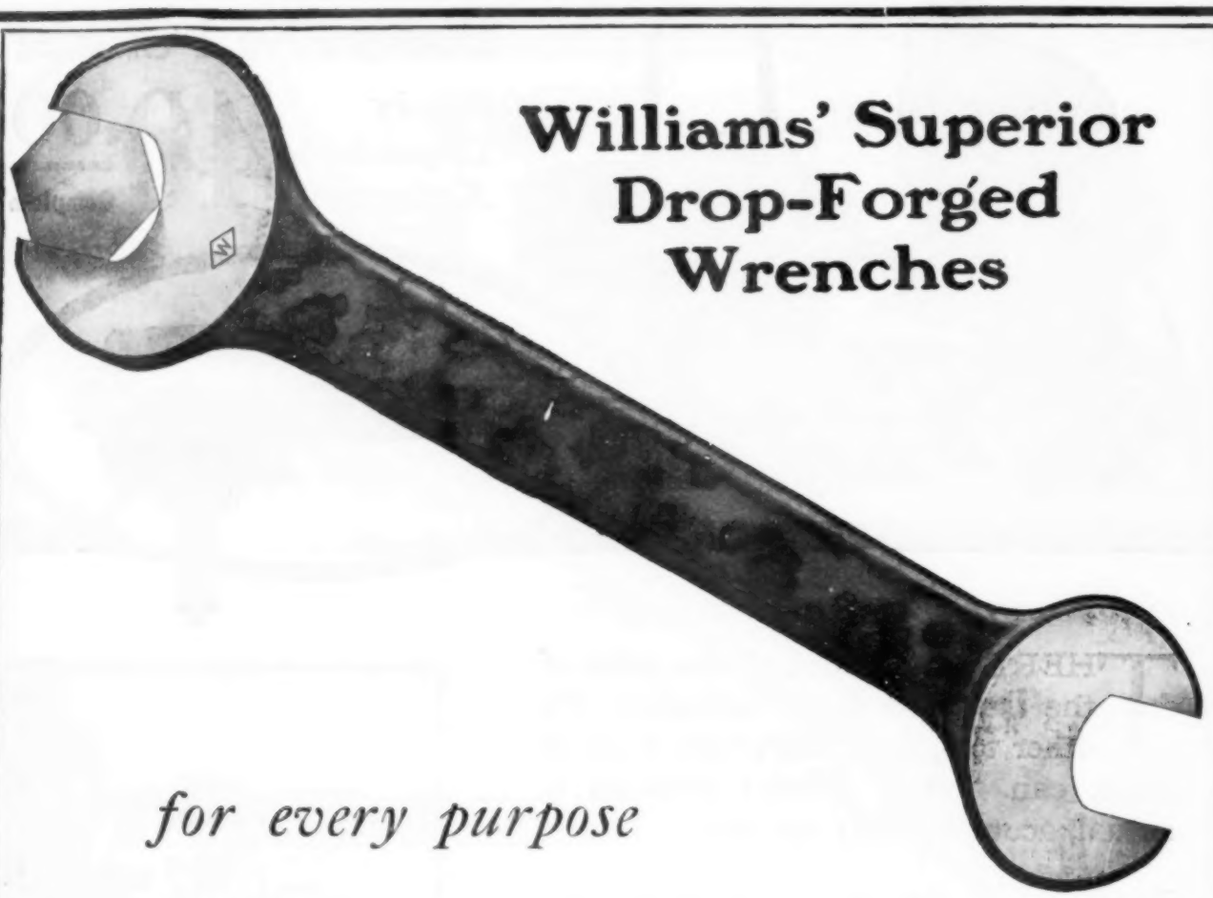






WISCONSIN ELECTRIC COMPANY
2717 SIXTEENTH STREET
RACINE, WIS.

DUMORE HIGH SPEED GRINDERS



Williams' Superior Drop-Forged Wrenches

for every purpose

WILLIAMS' *Superior* Drop-Forged Wrenches are unequaled where exacting service and dependable strength mean speed and efficiency.

There is as much difference in wrenches as in men:—power and worthiness in both are the fruit of careful, systematic development.

That's why the growth, of nearly half a century, of the Williams' Line stands for excellence in design and quality—that's why the words "Standard" and "Superior," as applied to Williams' Drop-Forged Wrenches, mean dependable service under the most severe conditions.

Every one of the 40 patterns in about 1000 sizes, with openings from 3/16 in. to 7⅝ in.—*standard* in design and size for every recognized trade need—carries the Williams' guarantee.

When you specify "Williams' Wrenches," you ask for the **best.**

May we send you a copy of our Wrench Booklet?

J. H. Williams & Co.

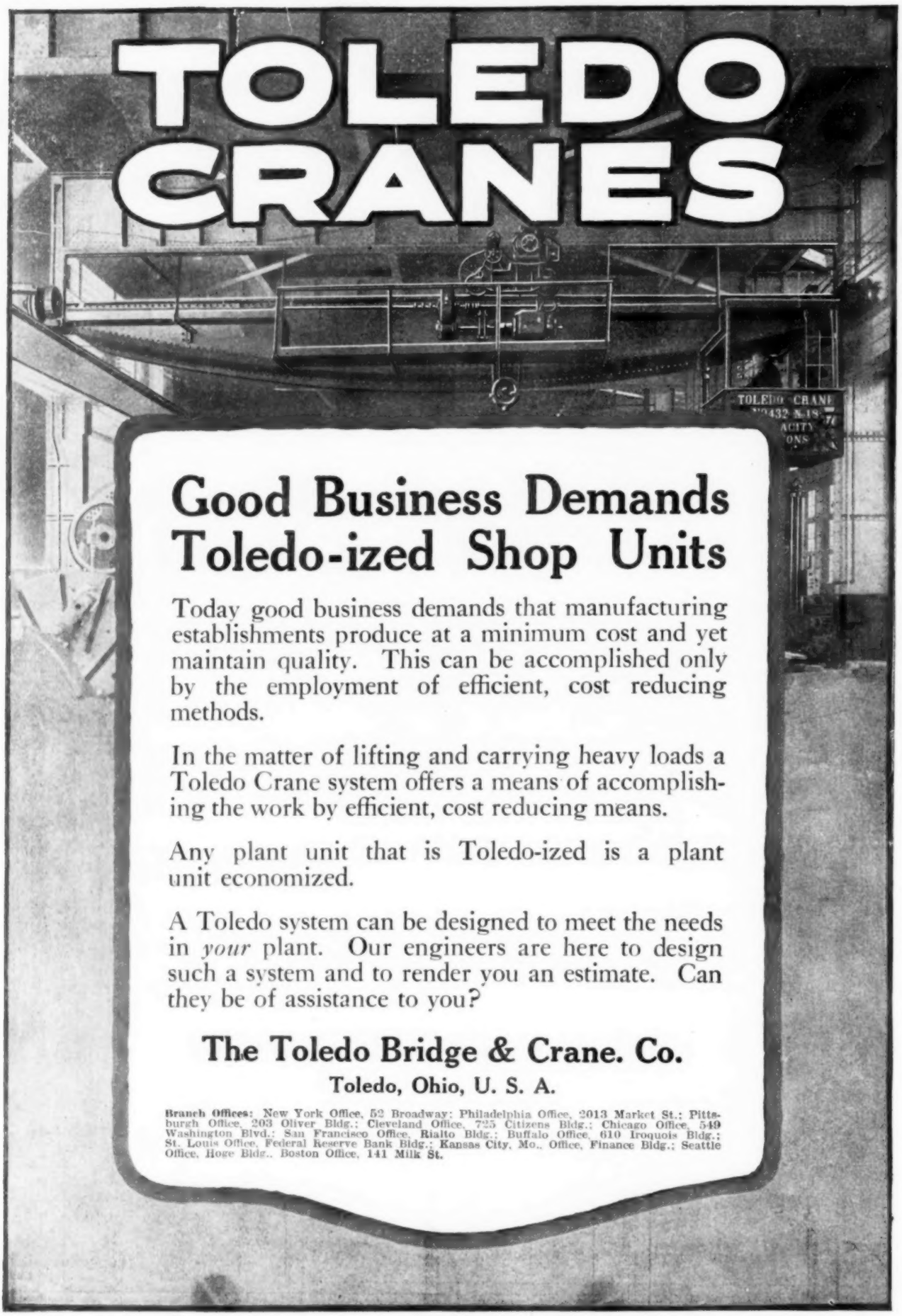
"The Drop-Forging People"

35 So. Clinton St., Chicago, Ill.

35 Vulcan St., Buffalo, N. Y.

35 Richards St., Brooklyn, N. Y.

RECOGNIZED
DEPENDABILITY
"Van Dorn"
GEARING
MEMBER OF AGMA
THE VAN DORN & DUTTON CO.
GEAR SPECIALISTS
CLEVELAND OHIO
STAFF



Good Business Demands Toledo-ized Shop Units

Today good business demands that manufacturing establishments produce at a minimum cost and yet maintain quality. This can be accomplished only by the employment of efficient, cost reducing methods.

In the matter of lifting and carrying heavy loads a Toledo Crane system offers a means of accomplishing the work by efficient, cost reducing means.

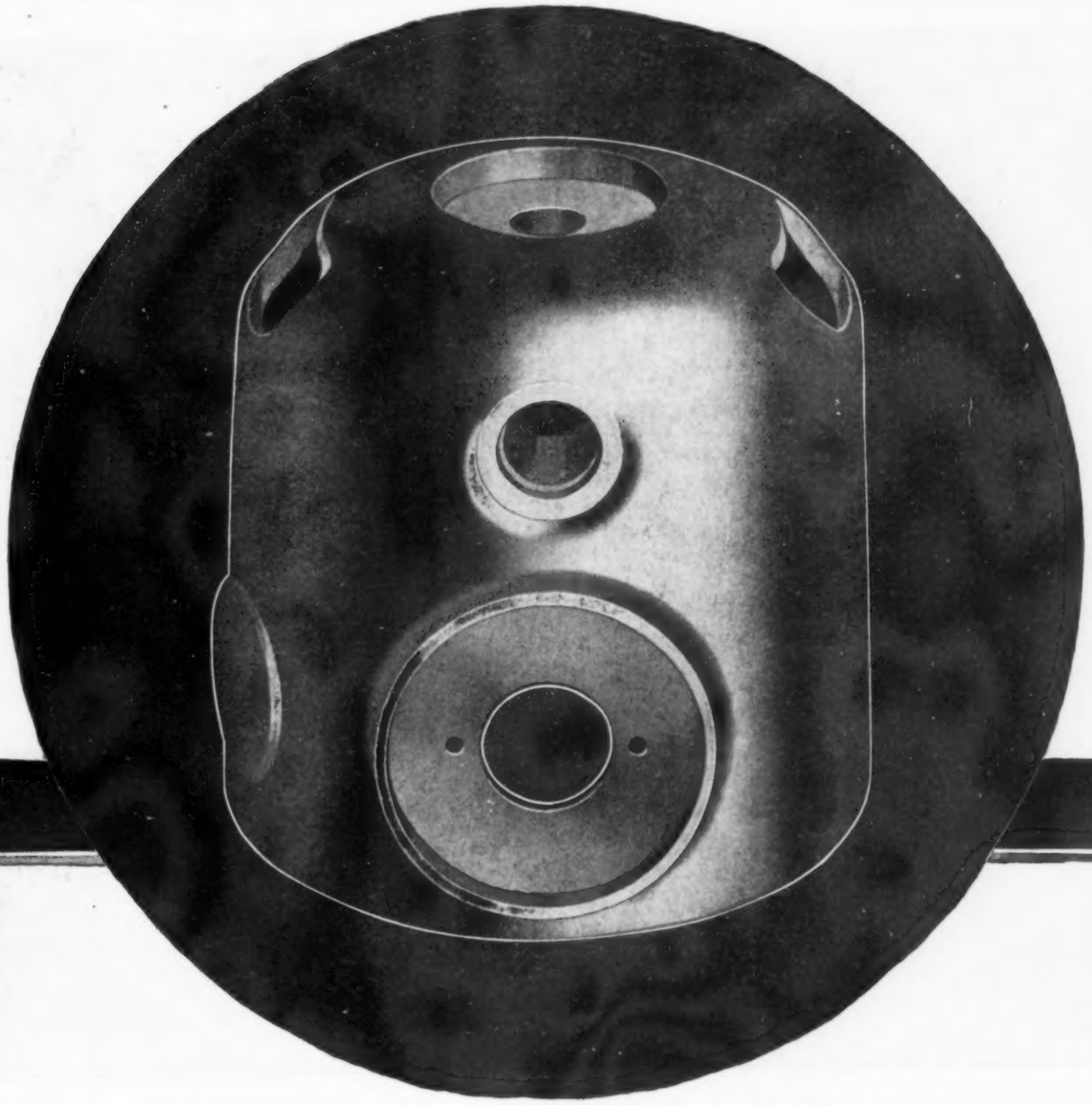
Any plant unit that is Toledo-ized is a plant unit economized.

A Toledo system can be designed to meet the needs in *your* plant. Our engineers are here to design such a system and to render you an estimate. Can they be of assistance to you?

The Toledo Bridge & Crane. Co.

Toledo, Ohio, U. S. A.

Branch Offices: New York Office, 52 Broadway; Philadelphia Office, 2013 Market St.; Pittsburgh Office, 203 Oliver Bldg.; Cleveland Office, 725 Citizens Bldg.; Chicago Office, 549 Washington Blvd.; San Francisco Office, Rialto Bldg.; Buffalo Office, 610 Iroquois Bldg.; St. Louis Office, Federal Reserve Bank Bldg.; Kansas City, Mo., Office, Finance Bldg.; Seattle Office, Hoge Bldg., Boston Office, 141 Milk St.



Safeguard Your Die-Casting Deliveries

—by contracting with a manufacturer of known stability

Failure to make deliveries of your die-castings means a slowing-up of your production. Delivery, in most plants, is equally important to quality.

When you buy castings made by the

Stewart Die-Moulding Process

your contract is in the hands of a concern of recognized permanence, stability and plant facilities, where adherence to contract is a certainty.

Small parts of almost any complicated shape—involving cored holes, or gear teeth—can be cast to machined accuracy at a high rate of speed and in a variety of alloys, to meet any specified equirement.

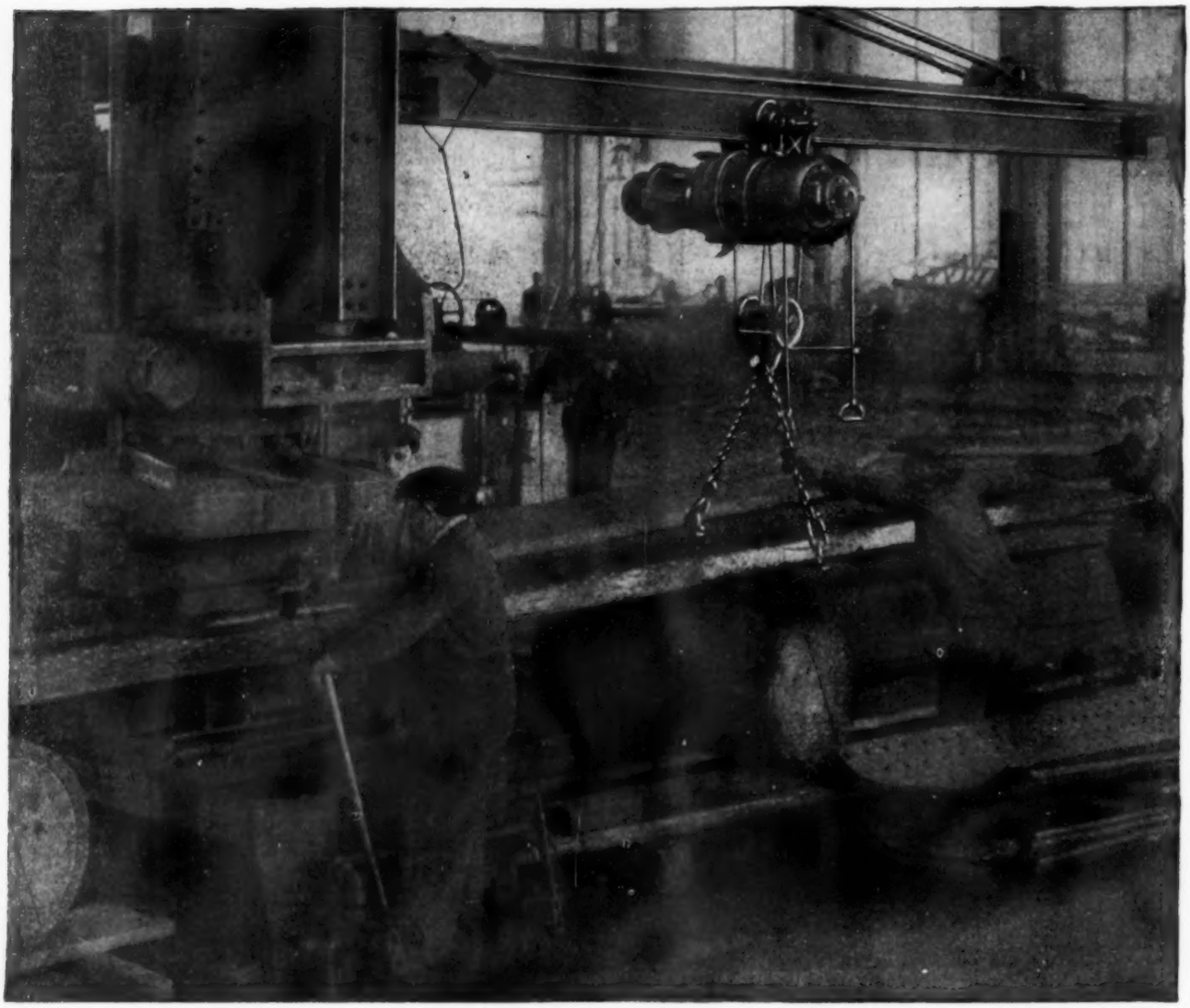
Send us a sample part or blueprint, with quantity used, and we will give you a quotation on it without obligation.

Write for the booklet "Let Us Die-Cast It"

STEWART MANUFACTURING CORPORATION

4500 Fullerton Ave., Chicago

Stewart



Difficult jobs simplified—

A Shepard Electric Hoist expedites punching, cutting, drilling, sawing, bending and similar operations. It facilitates raising heavy stock into position for feeding into the machine. The hoist trolley, equipped with roller bearings, carries the piece along the I-beam runway and simplifies the job of sending it through the machine.

No hand hoisting nor hauling. This easily controlled electric hoist does all the heavy work.

Avail yourself of the services of our engineers who can intelligently assist in the selection of suitable hoisting equipment.

Shepard Electric Crane & Hoist Company

352 Schuyler Ave. **Montour Falls, N. Y.**

New York Philadelphia Chicago Pittsburgh Boston Baltimore
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Member of Electric Hoist Manufacturers' Association

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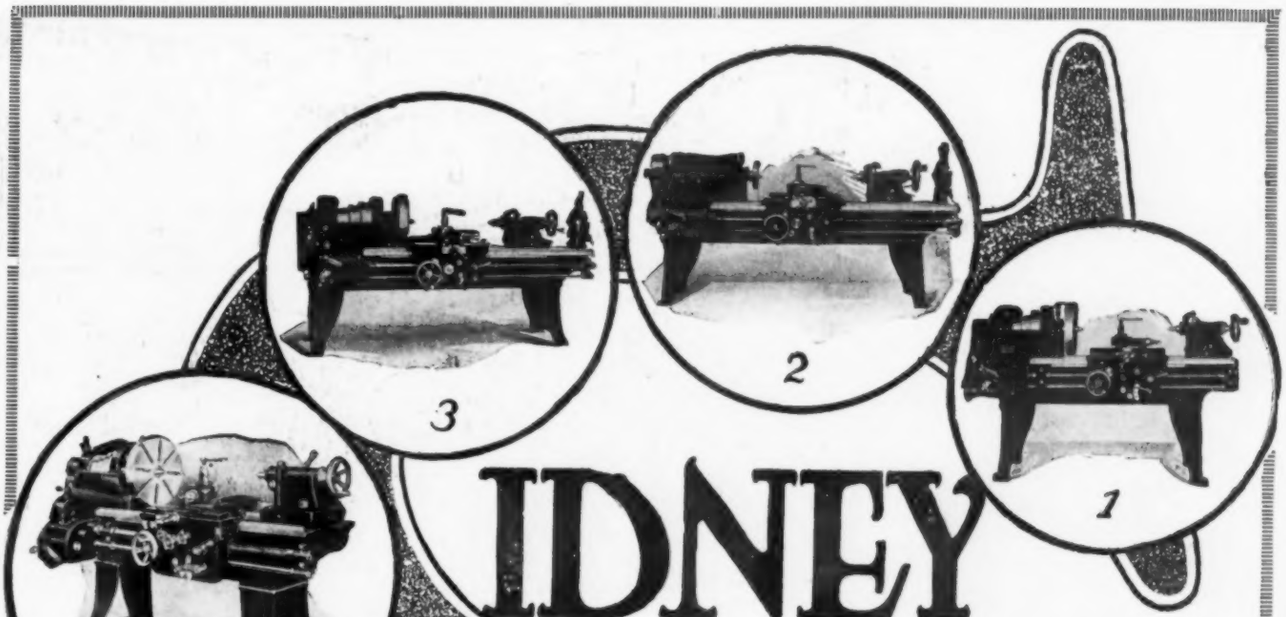
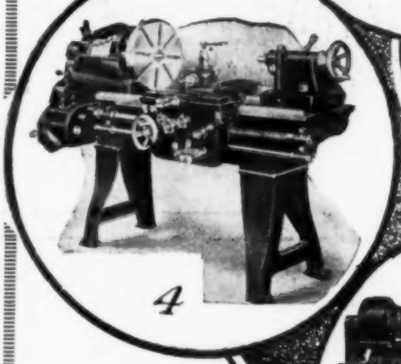
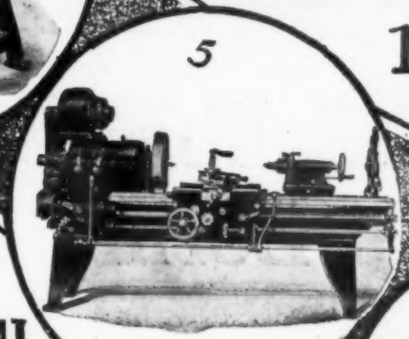
SHEPARD
ELECTRIC CRANES & HOISTS



SIDNEY

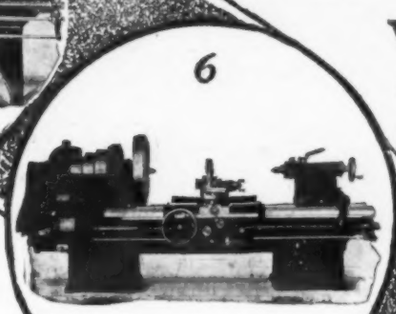
14 to 36 inch Swing LATHES





A lathe for every requirement

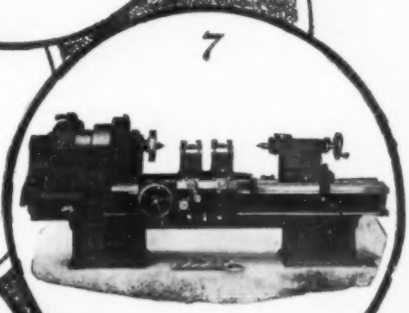
with any desired length of bed

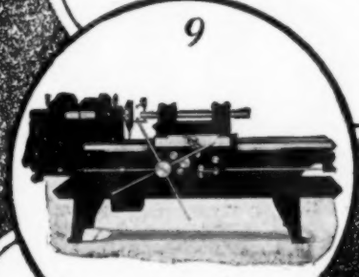


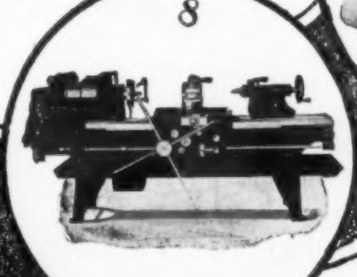
1. 14-inch Medium Pattern.
2. 17-in Geared Head Single Pulley Drive.
3. 17-inch Heavy Pattern.
4. 15-inch Heavy Pattern.
5. 17-inch Geared Head Motor Drive.
6. 25-inch Heavy Pattern.
7. 25-inch Single Purpose.
8. 17-inch Single Purpose.
9. 17-inch Single Purpose Boring.

There are many others. The Sidney Line of Lathes are built in 14 to 36-inch sizes.

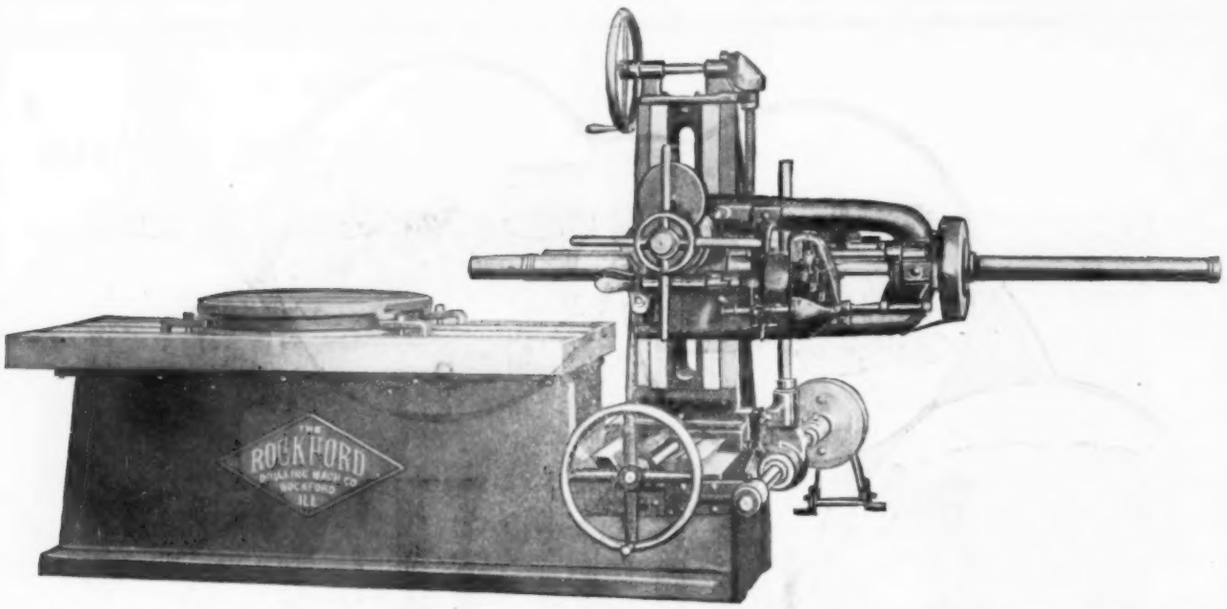
Tell us what your work is and we will tell you the Sidney Lathe designed and built to do it.







The Sidney Machine Tool Co.
Sidney, Ohio, U. S. A.



Circular Table Calibrated in Degrees on this Boring Machine

ONE of the features of this No. 2 Rockford Horizontal Boring Machine is the circular table calibrated in degrees. This machine is driven by a 3-Step Cone Pulley and Double Friction Countershaft.

Tables may be had 24 in., 30 in. or 36 in. wide with circular tables of equal size.

THE ROCKFORD DRILLING MACHINE CO. ROCKFORD ILL.

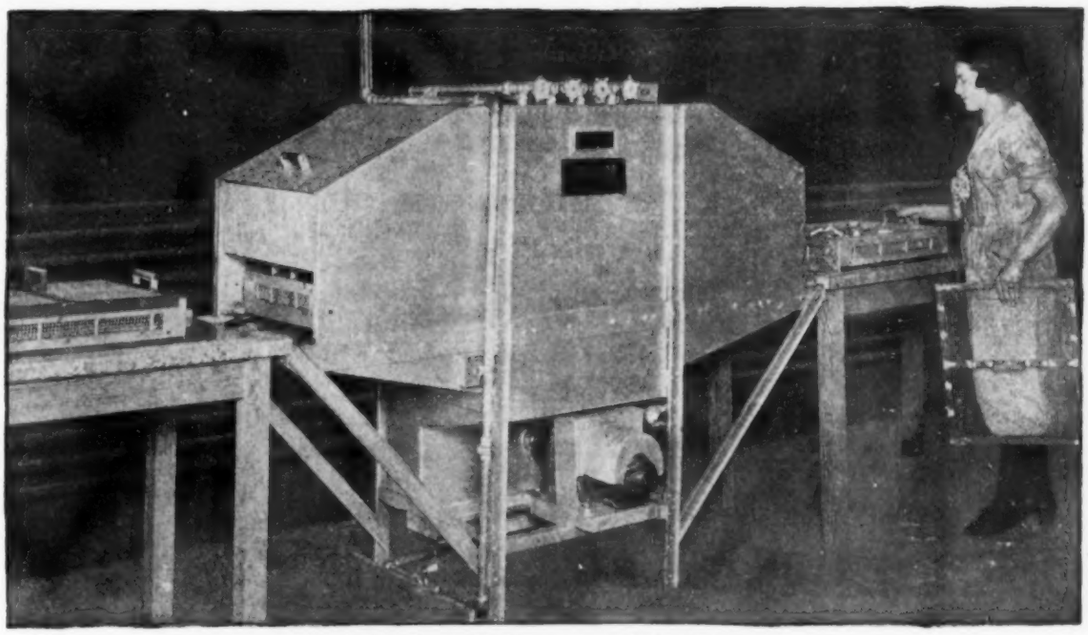
For complete details and prices write us direct or any of our agents.

Rockford Drilling Machine Company
Rockford, Illinois

ROCKFORD

E. L. Essley Machinery Co., 551 Washington Blvd., Chicago, Ill.; Marshall & Huschart Machinery Co., 334 North Capitol Ave., Indianapolis, Ind.; Marshall & Huschart Machinery Co., 905 Chemical Bldg., St. Louis, Mo.; Henry Prentiss & Co., Inc., Singer Bldg., New York City.; Henry Prentiss & Co., Inc., 724 Prescott Ave., Scranton, Pa.; Herberts Machinery & Supply Co., 405 E. Third St., Los Angeles, Calif.; Henry Prentiss & Co., Inc., 607 D. S. Morgan Bldg., Buffalo, N. Y.; Henry Prentiss & Co., Inc., 49 Federal Street, Boston, Mass.; Henry Prentiss & Co., Inc., 520 University Block, Syracuse, N. Y.; Henry Prentiss & Co., Inc., 315 E. & B. Bldg., Rochester, N. Y.; Somers, Filter & Todd Co., 323 Water Street, Pittsburgh, Pa.; Monarch Machinery Co., 300 Third Street, Philadelphia, Pa.; Strong, Carlisle & Hammond Co., 270 Jefferson Ave., Detroit, Mich.; Strong, Carlisle & Hammond Co., 326 Frankfort Ave., N. W. Cleveland; Herberts Machinery Co., 168 Second Street, San Francisco, Calif. Foreign Representative, Burton, Griffiths & Co., Ltd., London.

Well-known machine changes name



Doing the work of two men in half the time

"Nivin Metal Parts Washing Machine" now known as the "Crescent"

To identify this efficient metal parts washer more closely with the company that manufactures it, on December 1st the "Nivin" took the name of its makers, the Crescent Washing Machine Company.

Crescent
Metal Parts
Washing Machine
Formerly the "NIVIN"

The Crescent Washing Machine Company is the *original* and parent company under which the Nivin Mfg. Co. has operated. There will be no change in the machine. The factory, the personnel and the policy of the company are in no way affected. The parent organization remains intact, and the manufacture of the same high-standard metal parts washer will continue as before.

Nivin efficiency has increased production and lowered costs in hundreds of metal working plants. Our literature will gladly be sent without obligation.

CRESCENT WASHING MACHINE COMPANY

(The original Nivin Mfg. Co.)

837 Larrabee Street

CHICAGO

LIBERTY

MACHINING large, irregular shaped pieces oftimes proves a difficult problem with the machine tools at hand in many shops. When planing is necessary it is found that the part will not pass between the housings of an ordinary machine. Modern demands created the necessity for the Liberty.

48-in. Openside Planer

It has all the advantages and features of a double housing planer. The column and cross-rail are rigid to the extreme, making it possible to take any cut the tool will stand. The Column is of the two post, box type construction and extends to the floor. The Cross Rail is triangular shaped and is bolted and doweled to the brace or knee.

An ample foundation is afforded by the bed, which extends to the floor. The top is closed between the tracks except through the gearing section. At this point it is amply reinforced.

Table Running Gear, Driving Pulleys and Shifting Mechanism are all of the well known Liberty design and construction. The Patented Feed is a decided improvement and has many advantages over old-style mechanisms. All bearing surfaces are of ample design and the Rail Heads are made right and left for close range. When it is desired to use this machine as a double housing four head planer, the left hand housing and head can be attached at any time.

All parts are made to jigs and are absolutely interchangeable—Safety features are incorporated in its design.

You should know every feature of this modern machine tool.
Your literature awaits your call.

Liberty Machine Tool Co.
Hamilton, Ohio

FOUNTAINS
(Ice Cooled or Plain)
WASH BOWLS In Batteries
Great Variety **RACKS**
LOCKERS for Any Requirement
Indestructible **STOOLS**
and **CHAIRS**
PLUMBING Fixtures
METAL STOOLS Many Types

Fig. 501

Our Ice Cooled Fountain Fig. 604

Manufacturing Equipment and Engineering Co.
136 Federal Street, Boston, Mass.
Works and Mail Address, Framingham, Mass.
OUR LINES
Wash Bowls. Metal Lockers. All Steel Stools and Chairs with Inset Wood Seats, Stock and Storage Racks, Metal Shelving, Metal Vault Fixtures, Improved Soda Kettles—40 and 60 gallons, Water Heaters and Instantaneous Mixers, Bubbling Drinking Fountains. Work Benches and Bench Legs, Drawing Stands and a full line of PLUMBING MATERIAL.

GOODELL-PRATT

1500 GOOD TOOLS

Bell Centering Punches

Dependably Accurate

Designed to quickly and accurately center both round and square stock.

The punch has a bearing its entire length, and four case-hardened steel bearings equalize any unevenness of the stock.

This Punch is made of 5-16 inch tool steel, hardened, tempered and nicely polished

Write for complete catalog

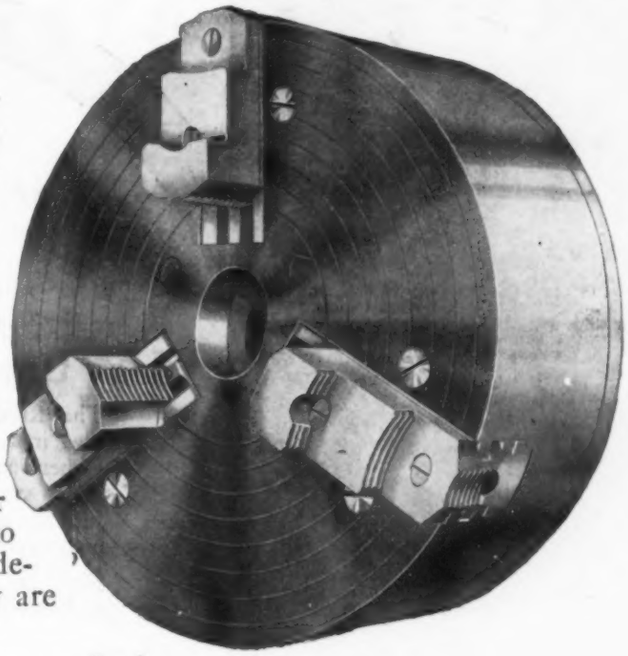
GOODELL-PRATT COMPANY

Toolsmiths

Greenfield, Mass., U. S. A.

Makers of Mr. Punch

What is the Value of a Lathe?



No matter how much you paid for your lathes—no matter how sturdy they are—no matter who the maker was, or what he put into them, their value can be determined only by what they are capable of earning.

Then if chucking operations on Lathe "A" consume seventy-five per cent more time than chucking operations on Lathe "B"—which lathe is making the most money for you?

That is the strongest argument we have for the M. E. C. Three-Jaw Air-Operated Chuck.

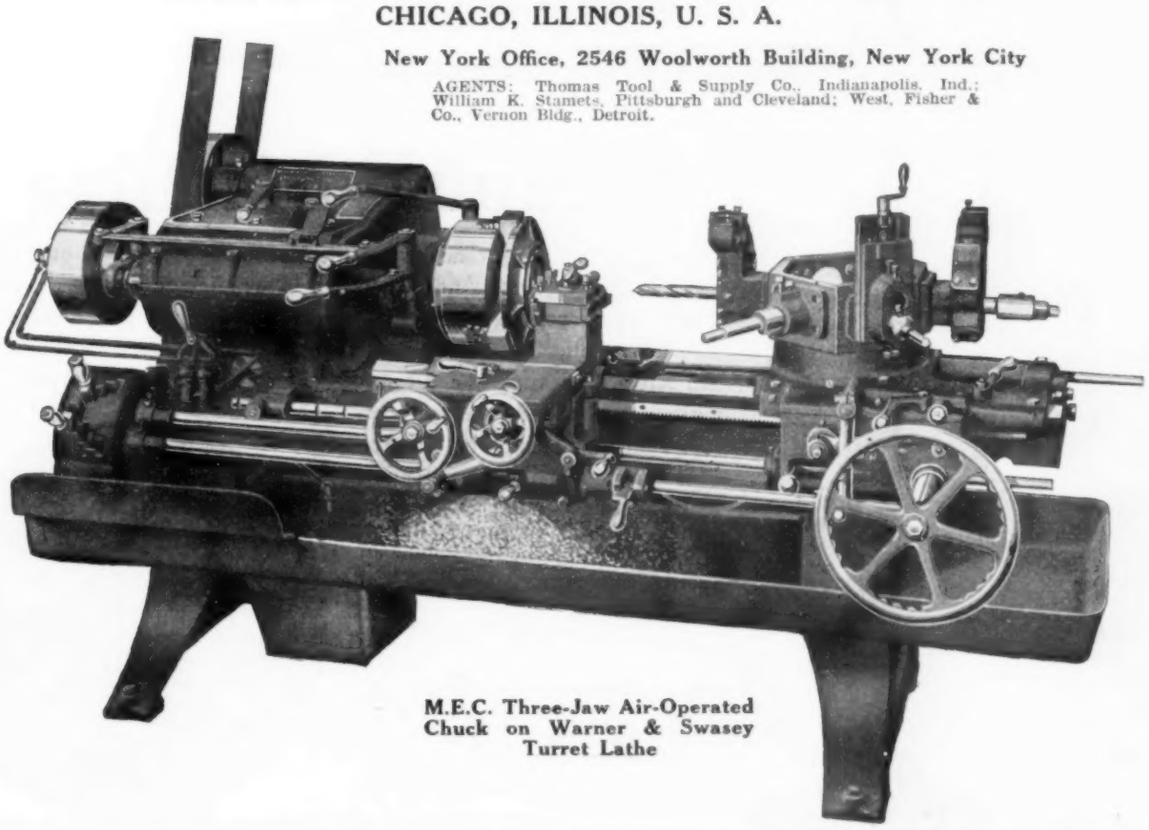
Literature will be sent on request.

MANUFACTURERS' EQUIPMENT COMPANY

CHICAGO, ILLINOIS, U. S. A.

New York Office, 2546 Woolworth Building, New York City

AGENTS: Thomas Tool & Supply Co., Indianapolis, Ind.; William K. Stamets, Pittsburgh and Cleveland; West, Fisher & Co., Vernon Bldg., Detroit.



M.E.C. Three-Jaw Air-Operated Chuck on Warner & Swasey Turret Lathe

RHODES

7-in. Horizontal and 3½ in. Vertical

SHAPER

Many Operations—One Machine

The Rhodes Combination Model can be used in a wide range of exact machining. Either as a horizontal shaper, with a 7-inch stroke, or a 3½ vertical slotter, adjustable to 10 degrees. Can be used for many operations.

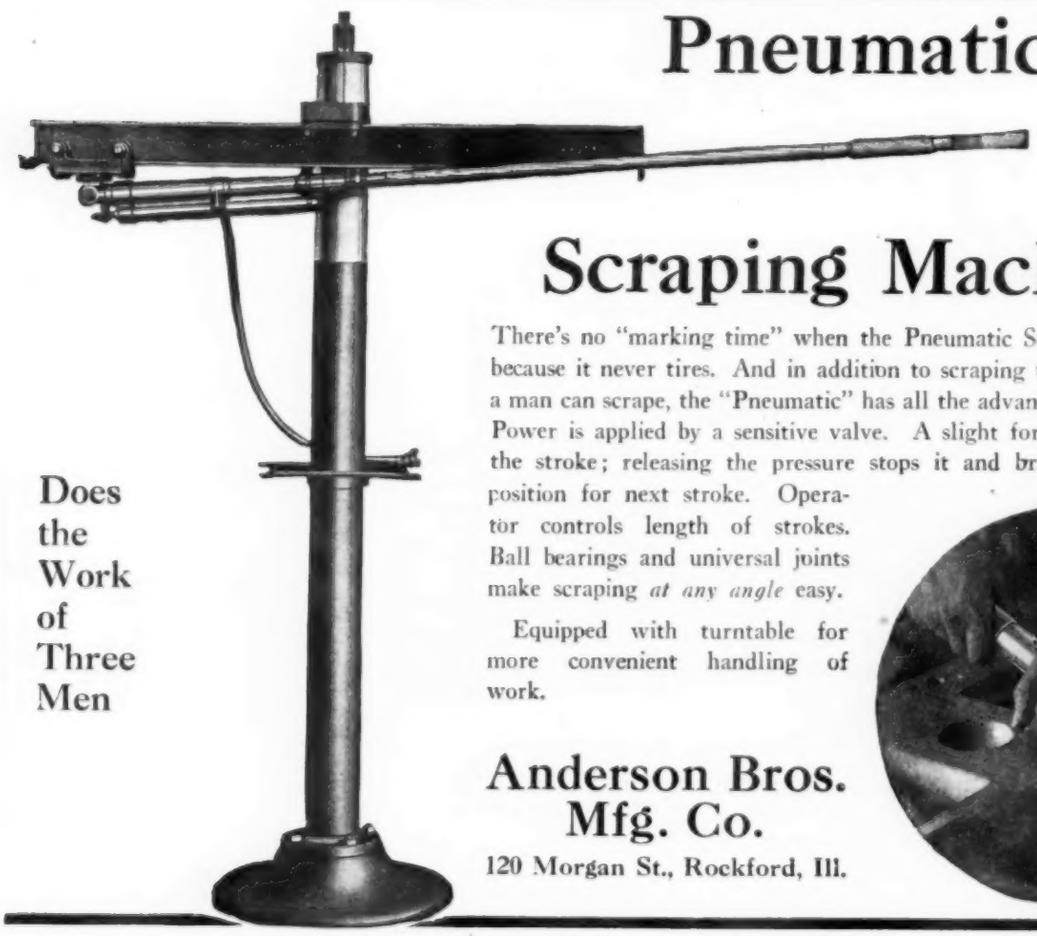
Fits into any small space, is easily set up, and can be operated by unskilled labor.

The Rhodes Mfg. Co.

Dept. 103

Hartford Connecticut

Pneumatic



Scraping Machine

There's no "marking time" when the Pneumatic Scraper is on the job—because it never tires. And in addition to scraping three times as much as a man can scrape, the "Pneumatic" has all the advantages of hand scraping. Power is applied by a sensitive valve. A slight forward movement starts the stroke; releasing the pressure stops it and brings the ram back to position for next stroke. Operator controls length of strokes. Ball bearings and universal joints make scraping *at any angle* easy.

Equipped with turntable for more convenient handling of work.

Does the Work of Three Men

Anderson Bros. Mfg. Co.

120 Morgan St., Rockford, Ill.

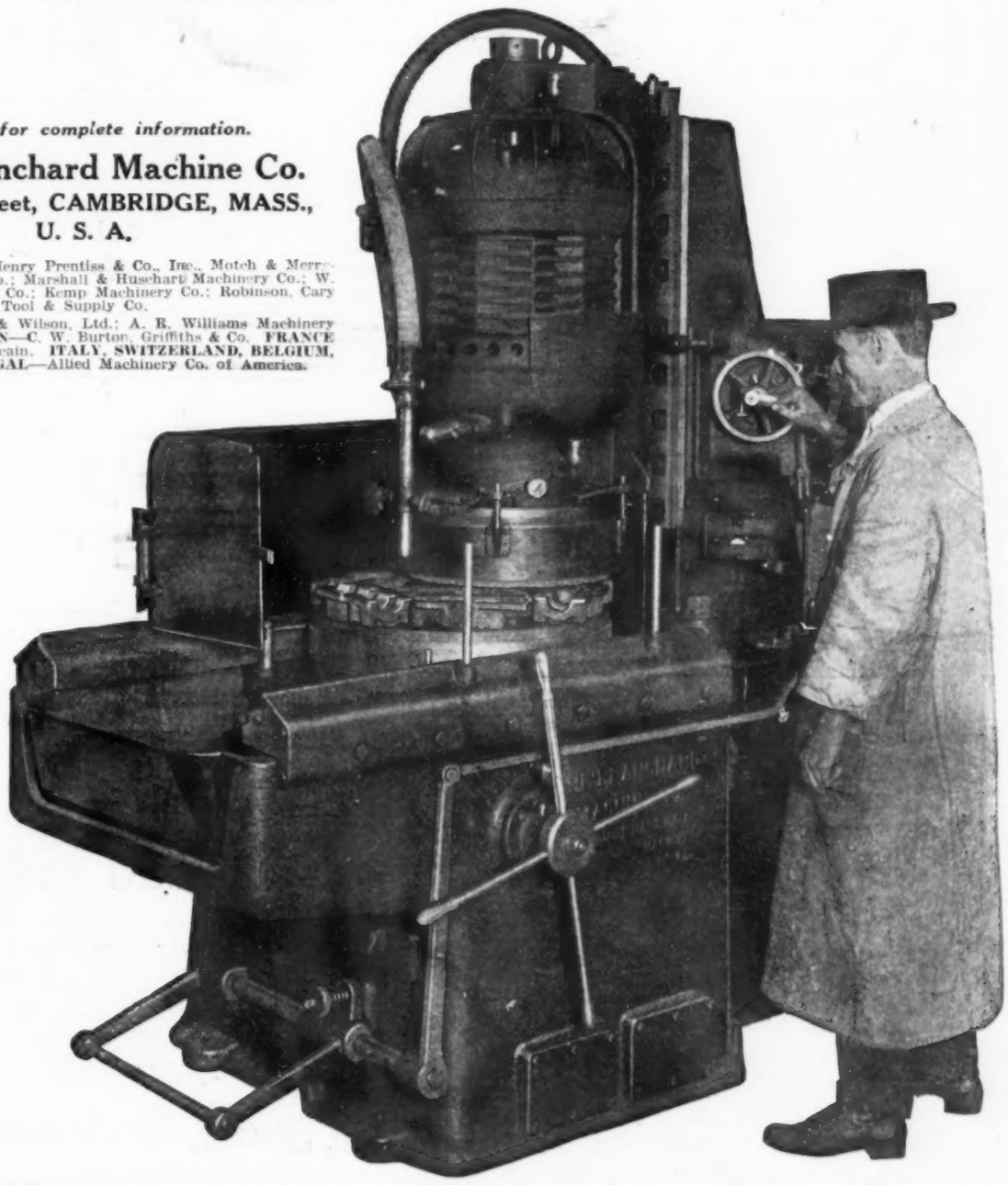
BLANCHARD

Cutting the H. C. M.

The High Cost of Manufacturing can be reduced with the Blanchard High Power Vertical Surface Grinder. It is being done this very hour in numerous plants.

The illustration shows a Blanchard grinding the two sides of cast iron bearing caps at the rate of 50 surfaces an hour. One surface on each piece makes an oiltight joint; the other is simply cleaned up.

You can Blanchardize your way to larger profits. For accuracy, variety, and volume of the work the Blanchard is unequalled.

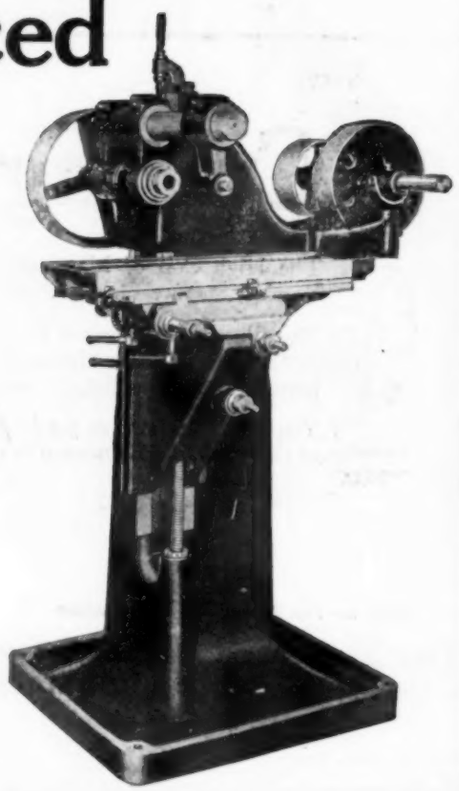


Ask us for complete information.

The Blanchard Machine Co.
64 State Street, CAMBRIDGE, MASS., U. S. A.

UNITED STATES—Henry Prentiss & Co., Inc., Motch & Merryweather Machinery Co.; Marshall & Huschart Machinery Co.; W. E. Shipley Machinery Co.; Kemp Machinery Co.; Robinson, Cary & Sands Co.; Pacific Tool & Supply Co.
CANADA—Williams & Wilson, Ltd.; A. R. Williams Machinery Co. **GREAT BRITAIN**—C. W. Burton, Griffiths & Co. **FRANCE**—Aux Forges de Vulcain. **ITALY, SWITZERLAND, BELGIUM, SPAIN AND PORTUGAL**—Allied Machinery Co. of America.

Vibration reduced to a minimum—



IN designing and constructing this No. 1½ model Standard Hand and Weight Feed Milling Machine unusual care was taken to obtain a correct distribution of metal to reduce vibration to a minimum, thus adapting this miller for the most exacting work.

It is provided with an unusually large table, and box, a box type which adds to its rigidity.

Longitudinal power feed to table can be furnished, also pump equipment and Standard Vertical Spline Milling attachment.

Micrometer dials are part of the regular equipment of this machine.

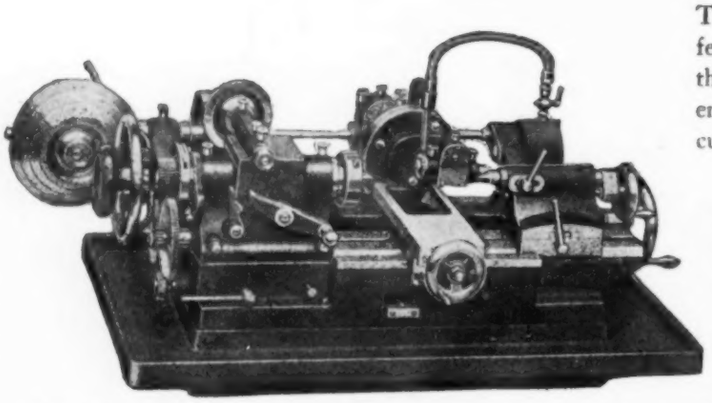
Complete specifications and prices will gladly be sent upon request. Write us today.

The Standard Eng. Works, Inc.

Pawtucket, R. I., U. S. A.

Manufacturers of Hand and Weight Feed Milling Machines; Hand, Weight and Power Feed Milling Machines; Hand, Weight, Power Feed and Automatic Spline Milling Machines.

You Can Vary the Thread to Allow for Changes In Hardening



Send us your blueprints and let us show you just what the Waltham will do for you. This will obligate you in no way.

The Compensating bar—a special Waltham feature—makes it possible to vary the lead of thread to allow for changing during the hardening process. This greatly increases the accuracy of work done on the Waltham. The

Waltham Bench Thread Miller

is a universal machine that for work within its range—7¼ in. long by 3 in. diameter—is superior to any other. It is speedy, accurate and effects a decided saving over the larger, costly machines.

Waltham Machine Works, High Street, Waltham, Mass.

Convenience and Economy

Here is a machine for your tool room that combines the convenience and speed of a planer with the accuracy of a shaper. It's the

COULTER TOOLROOM OPEN SIDE PLANER

which fills a need for a machine that will handle those jobs which neither a planer nor shaper could handle economically.

Its open side enables irregular-shaped pieces of large dimensions, having planing spots of long or short cuts, to be set up and machined quickly. The four speeds with which it is provided easily meet all requirements for machining a variety of materials. All control levers are centralized.

Our circular illustrates and describes the many advantages of this machine. It will interest you. May we send it?

THE AUTOMATIC MACHINE COMPANY

Bridgeport, Connecticut

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona

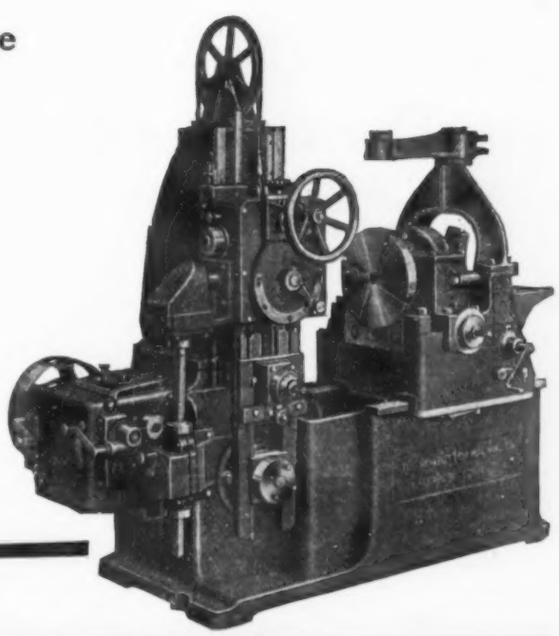
Keep Pace With Increasing Demands— Cut Your Cams on a Rowbottom

Start the New Year Right—

Install a Rowbottom Cam Milling Machine

You could do nothing better if your cam requirements amount to anything. Rowbottom cut cams are more accurate and less expensive than any others. The Rowbottom is the fastest and most economical machine on the market, it will save expense and increase your output.

If your needs are not sufficient to install a machine, let us cut what you do require for you—you can still get all the benefits of the Rowbottom way.



The Rowbottom Machine Co.

Waterbury, Conn. Factory, Waterville, Conn.

Rowbottom for Cams

How Great is Your Planing Production?

In these days when industrial efficiency and economy count for so much—when costs are high and competition keen, you should *know* whether you are getting the most out of your planers—whether your production is as high as it ought to be.

Study this matter; get the facts. Then investigate the Powell Hy-Speed Cut Planer—the Planer that cuts cast iron or steel at double the speed of the ordinary planer.

The Powell Hy-Speed-Cut or Accelerating Planer is the only planer that accelerates after entering the cutting stroke.

It will plane cast iron at 120 feet per minute, and nickel steel at a speed up to 150 feet per minute.

Let us demonstrate these facts to you. At any rate, send for our booklet "Cutting Your Planing Costs in Half."

Planing 3% Nickel Steel at 75-feet per minute with a 36-in. x 36-in.

POWELL

Hy-Speed-Cut PLANER

Let us demonstrate how to save 30% to 50% on your planer work

POWELL MACHINE COMPANY

243 STAFFORD ST., WORCESTER, MASS.

A Pleased Operator Is a Profit Maker

We'd like to send you a complete description.

To have every part of a machine accessible, to know that it is directly under one's control, is a joy to any operator.

The Cone Automatic

This requirement is more than met in the new Cone Automatic Four-Spindle Screw Machine. It's a sturdy machine, too. Built for hard and constant usage.

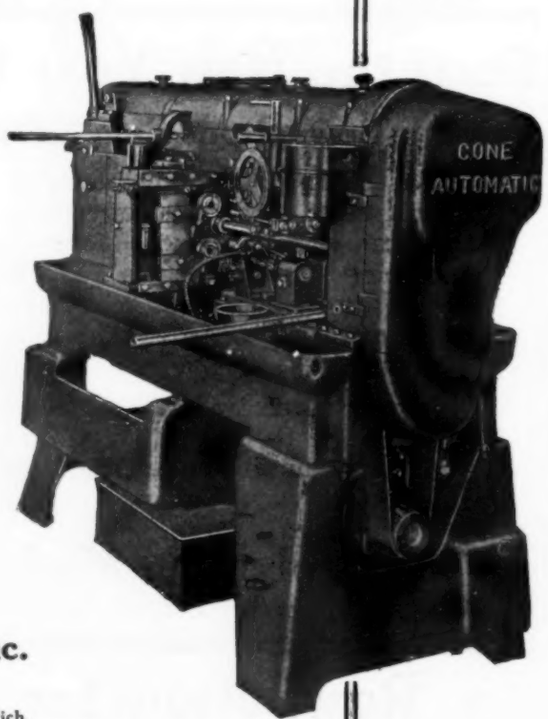
The cams, drums and working parts, are all overhead and entirely encased, thus protecting the operator from getting caught or injured in working mechanism. The cams are free from all dirt and chips and easily accessible in setting up the machine.

Work is positively separated from the chips.

Spindles are hardened and ground and run in adjustable phosphor bronze bearings.

Has the widest tooling range.

Cone Automatics are made in four sizes, 1 in., 1¼ in., 1½ in. x 6 in., and 3½ in. x 7 in. long.



Cone Automatic Machine Company, Inc.

Windsor, Vermont

Agent Michigan Territory: Mr. J. C. Austerberry, 65 Shelby ⌣ , Detroit, Mich.

No stripped threads with this die

Phantom View
Showing Construction

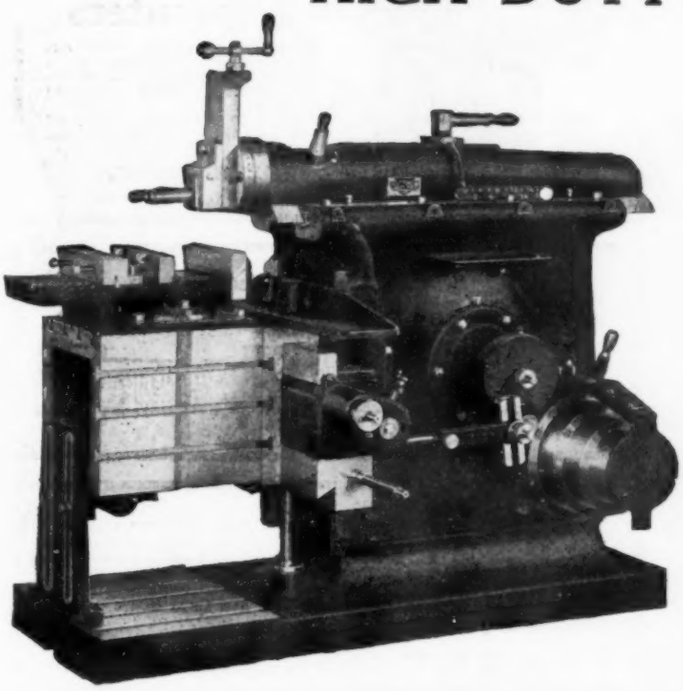
"BOEHM" Die Heads have a dependable, positive opening device which automatically opens when the desired length of thread is cut. This feature is particularly appreciated when threading close to shoulders. It also eliminates stripped threads, for when the head is backed off the work, the chasers open and do not touch the finished threads.

The many unusual features of "Boehm" Die Heads are interestingly described in our circular which we will mail you promptly upon request. *Write.*

RICKERT-SHAFER COMPANY, Erie, Pa.
New York Office: 50 Church Street
Agent for Sweden: A. B. Galco, Ltd., Stockholm. Agent for Belgium, Atelier De Moore, Brussels.

MATTISON

HIGH DUTY SHAPERS



IT HAS been with a firm determination to give the industrial field a shaper of unexcelled performance, that we have built the Mattison.

In it you will find embodied every basic principle of efficiency that is essential to the stringent demands of today.

The Mattison High Duty Shaper is so designed and constructed that you will find it a simple, yet extremely powerful and rigid machine, capable of long, hard, continuous work with the smallest possible consumption of power.

So let us wish you the compliments of the season and send you descriptive literature on Mattison High Duty Shapers.

Mattison Machine Works
Rockford, Illinois, U. S. A.

WOODWARD AND POWELL

PLANERS

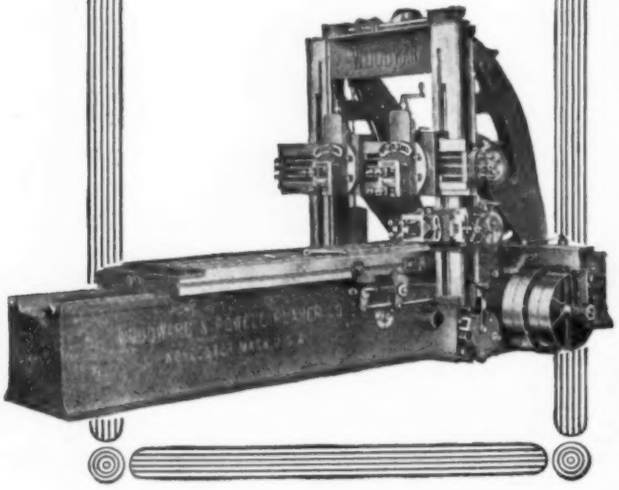
Reduce Machining COSTS

The extra long tables of Woodward & Powell Planers, which are well provided with "T" slots, enable your operators to machine a number of duplicate pieces in one setting. The result of this method being quantity production and a consequent reduction of the cost per piece.

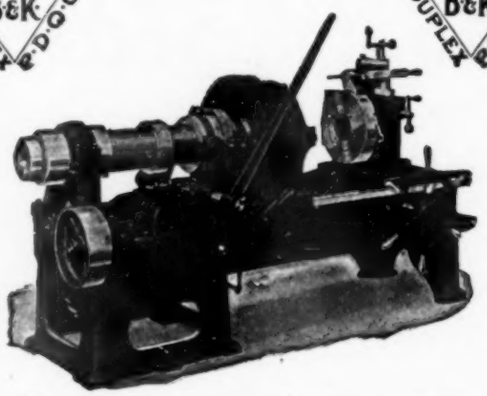
There are many other splendid features embodied in the design of Woodward & Powell Planers which we know will interest you.

Why not send for full details?

Woodward & Powell Planer Co.
Worcester, Mass.



PEERLESS B&K DUPLEX P.D.Q.C

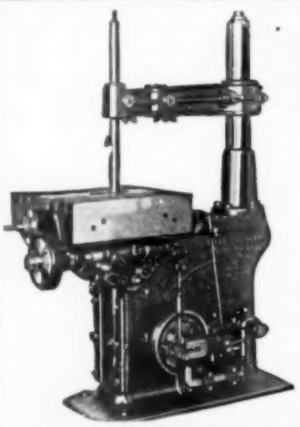


Rapid and Accurate Pipe Threading

Is the kind done by B & K Pipe Threading Machines. They work with remarkable rapidity and ease of operation. Every thread is clean and accurate. Every machine is equipped with the Peerless Die Head. Made in nine sizes, each size having a capacity of 8 to 10 sizes of pipe.

Write for complete catalog

Bignall & Keeler Machine Works
Edwardsville, Ill.



Accurate Keyseats

An inaccurate keyseat may easily cause an expense in fitting that will equal the cost of cutting a great many keyseats.

BAKER Keyseaters

insure your keyseats being cut with maximum accuracy. These machines operate on the draw-cut principle. They are rapid producers.
Ask us to mail you a copy of our Bulletin on Keyseaters and Slotters.

BAKER BROTHERS
Toledo, O., U. S. A.

Send Us Your Inquiries for

BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

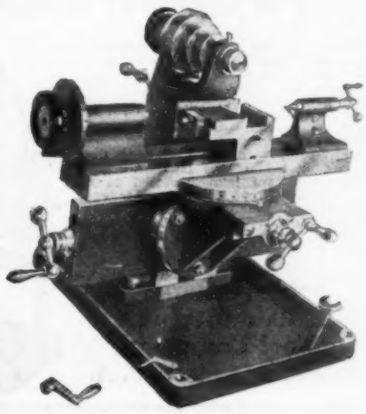
THE NATIONAL MACHINERY CO. TIFFIN OHIO U.S.A.

Stamets No. 44 Vertical Milling Machine

This machine has a place in your manufacturing department. It is rigid and accurate and a premier producer of duplicate parts. It was designed for present day needs. Let us mail you the descriptive circular. See our large ads. in the first and third issues of each month.

WILLIAM K. STAMETS, Pittsburgh, Penna.

The S. & C. Bench Miller for Toolroom Work



The S. & C. Miller is unsurpassed for tool and experimental work. It has every requisite—it is speedy, accurate to closest limits, has a wide capacity and is strong and durable.

It has a number of appealing features not found in other machines. We would like to tell you about them all. Ask us.

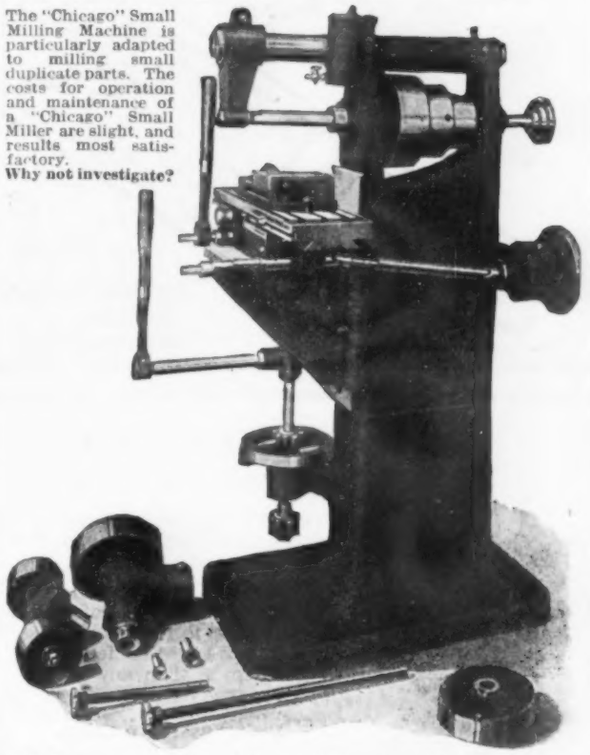
Sloan & Chace Mfg. Co., Ltd.

6th Ave. and No. 13th St., Newark, N. J.

Manufacturers of Precision Machinery, Bench Lathes, Drill Presses, Milling Machines, Gear and Pinion Cutters, Tools, Fixtures and Gauges.

Investigate This Miller

The "Chicago" Small Milling Machine is particularly adapted to milling small duplicate parts. The costs for operation and maintenance of a "Chicago" Small Miller are slight, and results most satisfactory.
Why not investigate?



Chicago Machine Tool Company
647 Washington Blvd., Chicago, Ill., U. S. A.

CLEVELAND

Horizontal Boring Milling and Drilling Machine

Find out about this rigid, powerful, rapid producing thoroughly modern machine. Centralized control makes easy operation. Adjustments against wear

We'll be glad to send details

The Cleveland Machine Tool Co.
Cleveland, Ohio
Established 1907

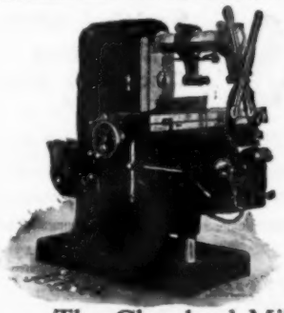
"Cleveland" Open Side Planers

Any size from 30 in. to 72 in., any length.

Write for the descriptive matter.

See first issue of each month for illustrations.

Cleveland Planer Co.
Cleveland, Ohio
Established 1900



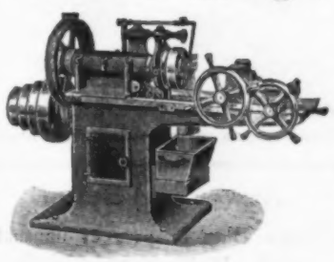
We are manufacturers of Milling Machines, Milling Cutters Universal Relieving Machines, Special Tools, Profile Grinders and Plain Vises.

Write for information about any you are interested in before buying elsewhere—

The Cleveland Milling Machine Co.
Cleveland, Ohio
Write for Our Stock List of Cutters

New York Office: 1760-2 Woolworth Bldg. Detroit Office: 271 E. Jefferson Ave. Pittsburgh Office: 203 Oliver Bldg. Chicago Office: 435 Stock Exchange Bldg.

Bolt Cutting At Higher Speeds



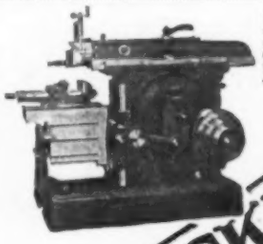
Many ingenious devices add to the working range and speed of the Acme Bolt Cutters.

Power is transmitted to working parts in a way to cut out the lost motion, thus making every movement productive without unnecessary wear.

All materials are the best for its service.

Write for Catalog which shows our complete line.

The Acme Machinery Company
Cleveland, O., U. S. A.



Patented Speed Features

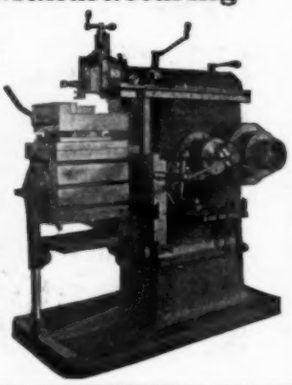
STOCKBRIDGE SHAPERS

Write for Bulletin

The Stockbridge Machine Co.
Worcester, Mass.

For General Manufacturing

While primarily intended for toolroom work the Sellew Double Purpose Shaper has been made heavy enough and rigid enough and with extra height for general manufacturing. The Sellew is particularly convenient to adjust and to operate. The operator may make all adjustments, settigns and speed changes from one point on the operating side of the machine. Adjustments have been increased to a maximum without upsetting the convenience of operation. Note the swiveling table having the outboard table support, insuring rigidity and accuracy to the table.



We'll be glad to go into details. Send for circular today.

Sellew Machine Tool Company
Pawtucket, R. I., U. S. A.

One Man with a Forbes Pipe Cutter

can do the work of four—working on the same sort of job by hand.

The *Forbes* is motor driven, semi-portable type, cuts and threads up to 12 inches diameter. Takes five feet less floor space than any other. Saves power.

Write us for catalog.

The Curtis & Curtis Company
66 Garden St., Bridgeport, Conn.

Tool Chests

Our chests are the strongest, best and most up-to-date of any on the market.

The only chest made of 3-ply veneer.

J. M. Waterston
80 Woodward Ave.
Detroit, Mich.

Write For Catalog

Waiting for the Gong—

In our Engine Repair Department are men who are familiar with every manner and type of engine breakdown. These men make up the

UNDERWOOD Wrecking Crew

Members of the crew are on the job at all hours awaiting the call to duty—which duty involves the truing-up, repairing or overhauling of engines, no matter where, *nor when!*

Have you called them?

H. B. Underwood Corp.
Established 1870 Philadelphia, Pa.

Cut and Planed Gearing

of every description.
Let us remedy your gear troubles.
Special attention to rush work.
Accurate work and honest delivery promises.

The Simonds Manufacturing Co.
Pittsburgh, Pa.

KELLY SHAPERS

Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. Three sizes single geared, four sizes back geared. Write for a Catalog.

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Newer and Better

Heavy Duty Shapers of unusual merit. 16, 20, 24 and 28-inch.

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Hall Planetary Thread Millers

Reduces threading cost 50% on some classes of work. Cuts all style threads internal or external.

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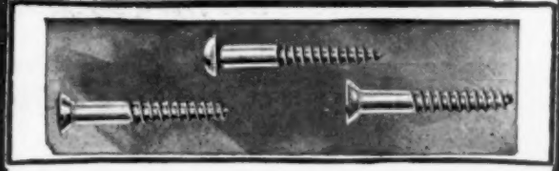

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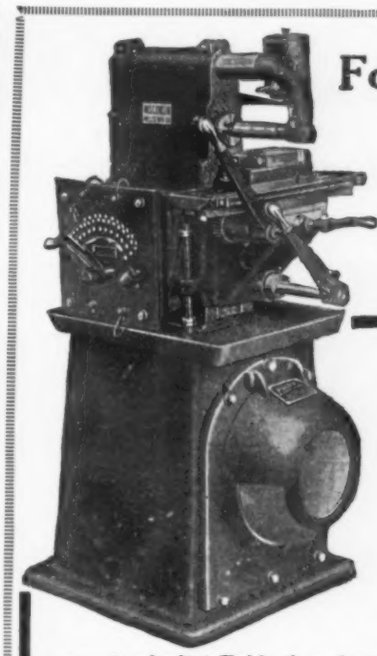

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Spindle is made of special spindle steel. Cone has four steps. Eight speeds can be obtained through countershaft. Table has large working surface with oil pockets at each end. Extreme travel through lever is 5 in., through crank 12 in. Countershaft has two speeds, and is self-oiling. Longitudinal feed is 12 in. transverse feed 4½ in., and vertical feed 5¾ in. Height of machine, 52½ in. Guaranteed for one year.

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KEYSEATS

with this tool. Save fifty to seventy-five per cent. in time. Small first cost; save more in operation. Mills all keyseats alike—no filing or fitting of keys required. This tool is an attachment for the drilling machine and is fitted with a high-speed steel rotary cutter that mills internal keyseats in one cut.

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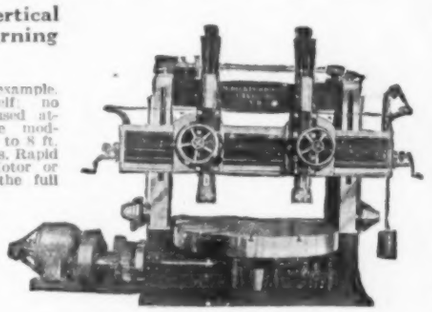

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The wide range of screw machine jobs and the large output made possible on the Davenport Multiple Spindle Automatic Screw Machine, enlarges the working capacity of any shop having this kind of work to do.

There's no sacrifice in accuracy or finish to get the "Davenport" output.

Many users say that they have taken on business which could never be touched under old production costs.

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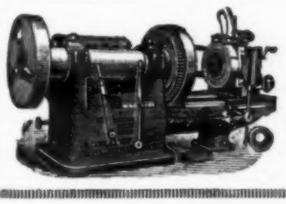

Tube Mill Machinery—Seamless and Welded.
Rolling Mill Equipment. Rolls—Sand and Chilled
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Castings—Gray Iron, Semi-steel, Cupola and Air Furnace.
Machine Work to drawings.

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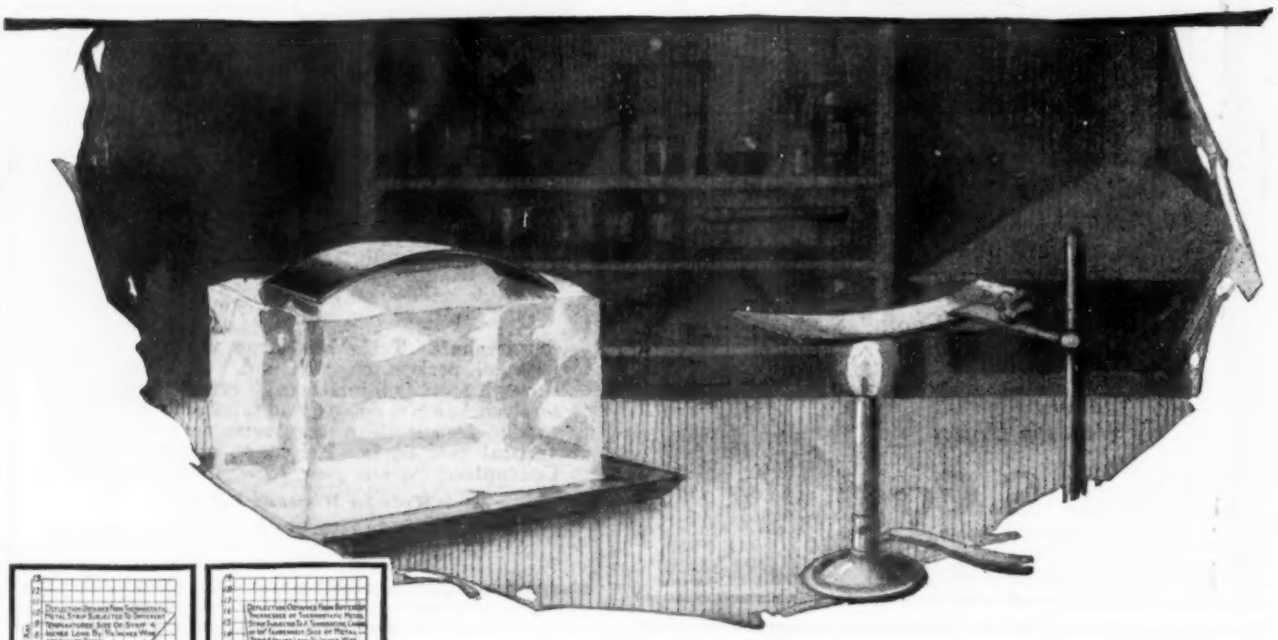
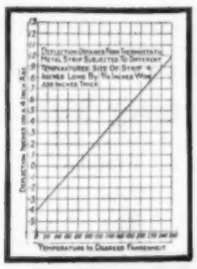
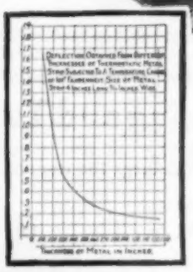
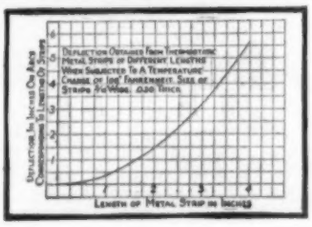
Many devices operate at increased efficiency or with greater accuracy when temperature compensation is provided automatically








Deflection Obtained From Thermostatic Metal Strips of Different Lengths When Subjected To A Temperature Change of 100° Fahrenheit. Size of Strips Are Width .625 Thick
Length of Metal Strip in Inches

These curves and others that show the effects of the definite laws governing G-E Thermostatic Metal's performance are reproduced in the Booklet B-3435,—"G-E Thermostatic Control." It is yours for the asking.

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If you have a heat compensation problem, our specialists will be glad to assist you. Write the address below.

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Machine Tool Motors and Control

Type SK—The Motor With the Forged Steel Frame

The Forged Steel Frame combines great strength with minimum weight and bulk.

This motor is used in most every industry—from the general to the most special industrial applications.

Westinghouse Electric & Manufacturing Co.
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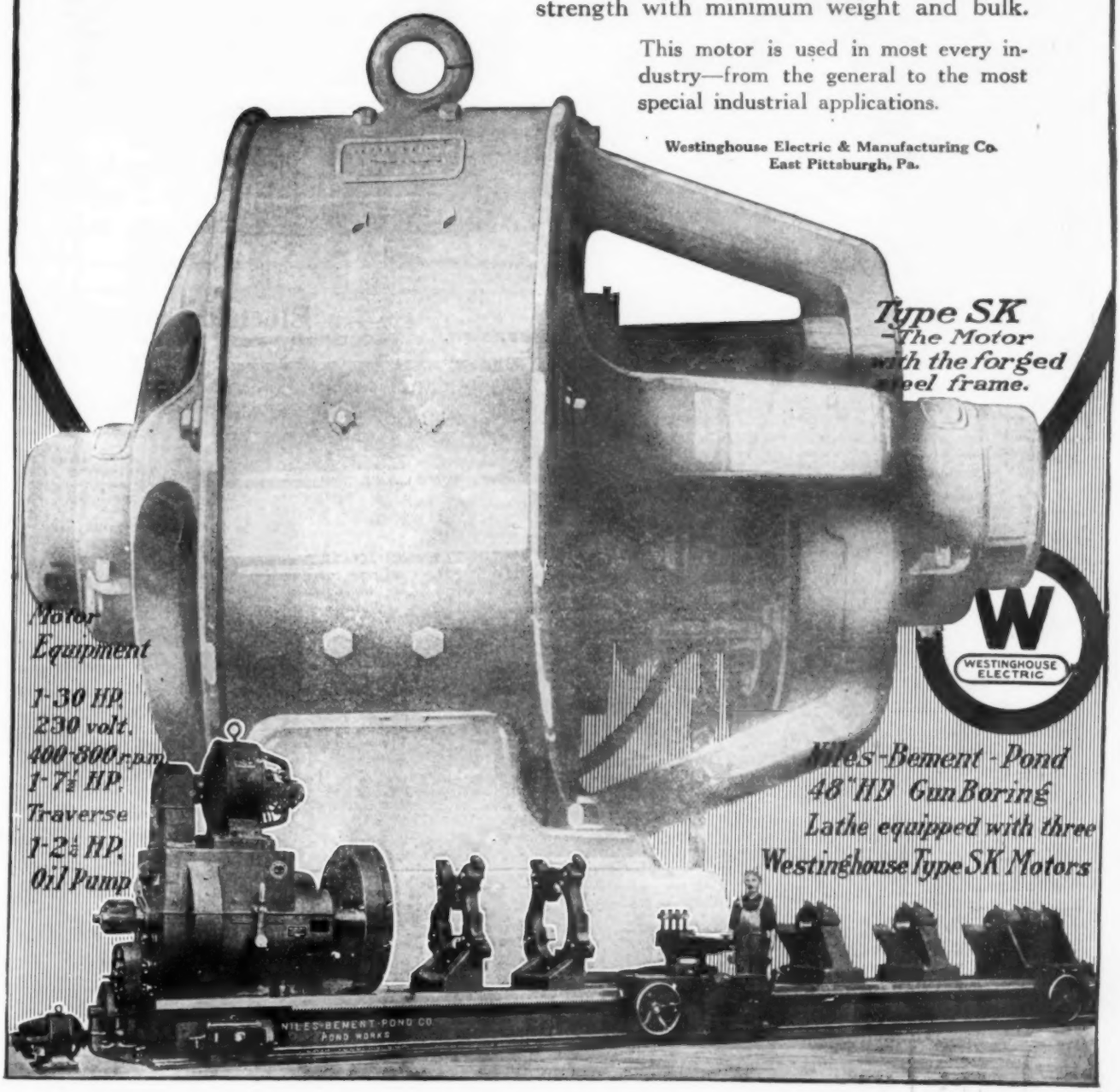

Type SK
—The Motor with the forged steel frame.

Motor Equipment
1-30 HP. 230 volt. 400-800 r.p.m.
1-7½ HP. Traverse
1-2½ HP. Oil Pump

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WESTINGHOUSE ELECTRIC

Niles-Bement-Pond 48" HD Gun Boring Lathe equipped with three Westinghouse Type SK Motors

Unfailing Dependability

"Van Dorn"

Portable Electric Drills & Grinders

The Van Dorn Electric Tool Co.
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Less Power to Run "Standard" Grinders

These machines are as light as possible, consistent with the power developed, and are built to meet the requirements of those seeking the Highest Production, Least Upkeep and Greatest Durability.

The best electrical practice and machine tool construction are employed throughout. All material and workmanship are guaranteed to be strictly high grade.

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The Standard Electric Tool Co.
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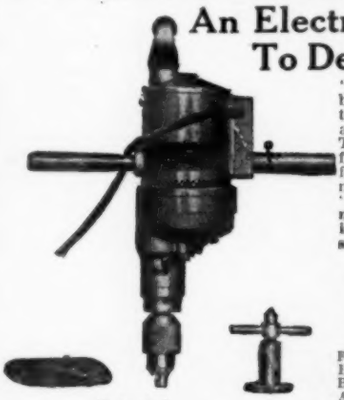

Patented

"Willey" electric drills can be depended upon at all times. They are electrically and mechanically correct. They will give absolute satisfaction and every one is fully guaranteed. You cannot go wrong with a "Willey." **Our Catalogue is most interesting. Send for it. Jacobs chuck used as standard equipment.**

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Will grind lathe centers mechanically with scientific accuracy in fraction of time required with other methods.

Builders of "Ideal" pat'd. Portable Electric Tools. Grinders, Drills, Saws, Screw Drivers, Nut Bolt and Lag Screw Setters.

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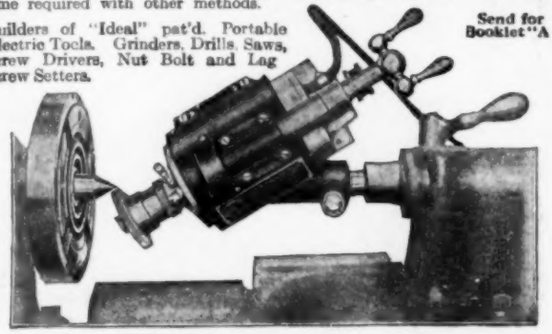


The Neil & Smith Electric Tool Co., Cincinnati, O., U. S. A.

Choosing Electric Motors Is an Engineer's Job

IF it were a matter of choosing motors simply on the basis of quality, most users could decide that for themselves. But there's a bigger problem which every motor buyer faces and it differs in each individual case.

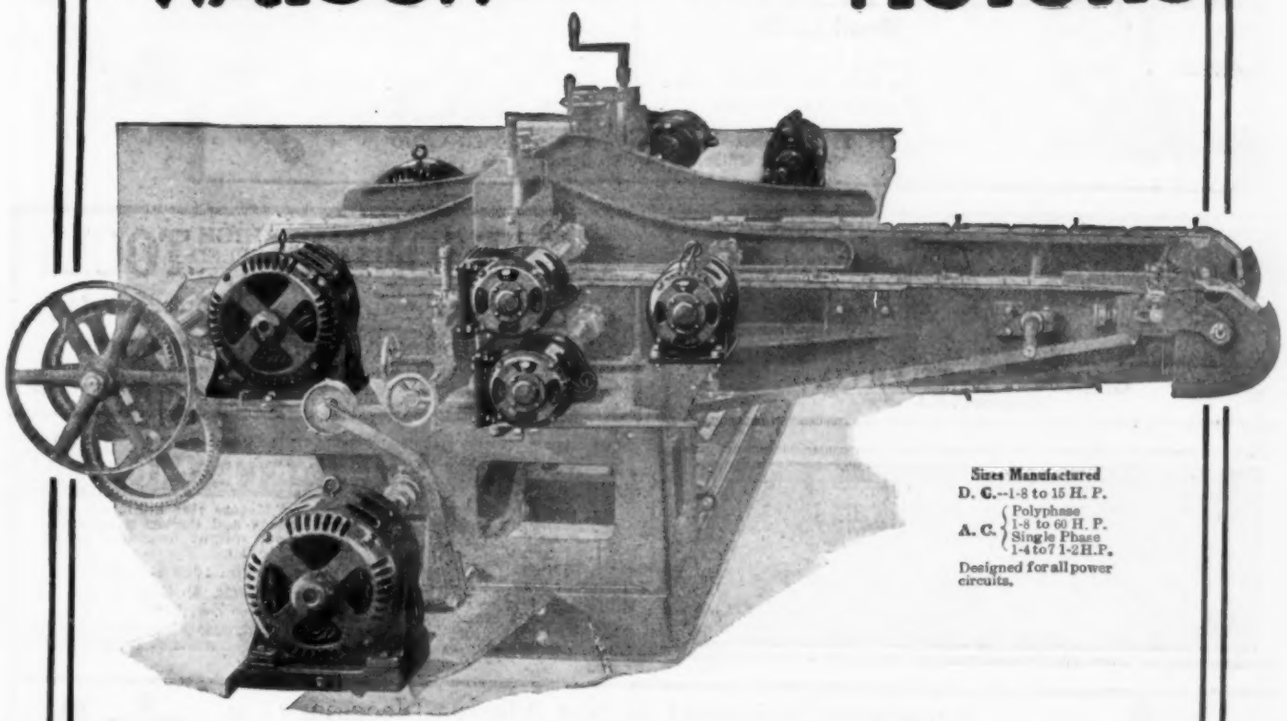
That problem is the application of power—fitting the motor to the job. It's a problem that requires knowledge of technical character.

For this reason, Watson Service is an important factor with motor buyers. It assures you the proper application of power because Watson engineers will co-operate with you and help you choose the right motor for your individual requirements.

Moreover, Watson Service is at your command after the sale as further assurance of proper operation. Whether you need a motor for general power purposes or as part of a power-equipped machine, Watson Service is ready for your call.

Every Watson salesman is an engineer.

WATSON ELECTRIC MOTORS



Sizes Manufactured
D. C.—1-8 to 15 H. P.
A. C. { Polyphase 1-8 to 60 H. P. / Single Phase 1-4 to 7 1-2 H.P.
Designed for all power circuits.

THE MECHANICAL APPLIANCE CO.

MILWAUKEE COMPANY WISCONSIN

Chicago, Detroit, New York, Boston, Buffalo, Cleveland, Minneapolis, Cincinnati, Pittsburgh, Philadelphia, Toronto, St. Louis.

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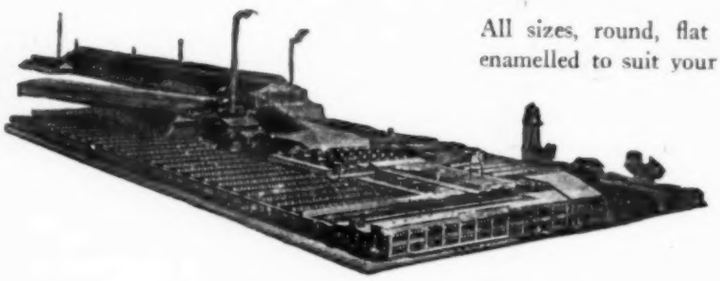
Wind Your Coils With ROME Wire

WHETHER you are a manufacturer of electrical equipment, re-wind and repair it, or merely sell it, you can be sure of satisfactory results if you use ROME WIRE electrical conductors.

Our magnet wire is popular because it's uniform and "as ordered." Our laboratory working in close harmony with our production department makes this certain.

All sizes, round, flat or square, and silk, cotton or enamelled to suit your requirements.



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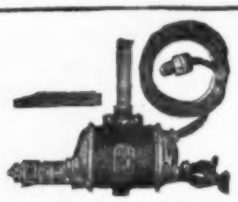
Wire Company
Rome, N. Y.

Roma-Wire



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Made in 12 sizes, ¼ to 2 in. capacities. Hand, Screw Feed, Radials and Bench Drills, Ball and Thrust Bearings.

Tool Post Grinders

¼ to 3 H. P. Weight from 16 pounds up. Free hand feed. Bearings adjustable to wear. Horizontal and vertical feeds. Different types for all purposes. Also Bench and Floor Grinders

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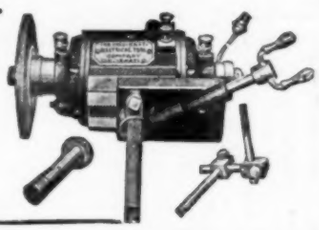

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"Niagara's Rival for Dependable Power"
CROCKER-WHEELER CO.
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for Faster Production and Lower Costs
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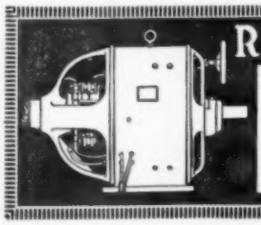
"THE ALWAYS DEPENDABLE"
BOSTON *Holtzer-Cabot* CHICAGO
FRACTIONAL H.P. MOTORS



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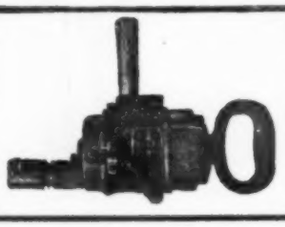
Type AS Motors give unlimited running speeds and deliver a constant horsepower output over any range up to 1 to 10.
Get Bulletin 1014 for details.
Reliance Electric & Engineering Co.
1044 Ivanhoe Rd., Cleveland, Ohio



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Take U. S. Electric Tools to the work and save four-fifths of the time usually required on each job. Every kind of portable drill, grinder and buffer ready for prompt delivery. **Write for Catalog.**

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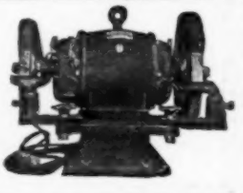
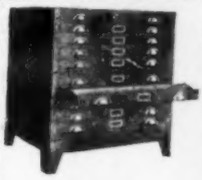
Boston Office, 12 Pearl St.
St. Louis Office, 610 Commercial Bldg.
Cleveland Office, 509 Guardian Bldg.

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LYON STEEL WARDROBE CABINETS

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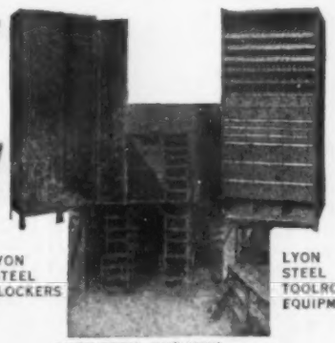
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Blue Print Cabinets	Steel Skid Legs	Bench Drawers
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Lyon Metallic Mfg. Co. 600 Madison St. Aurora, Ill.

STEEL SHELVING, LOCKERS AND GENERAL EQUIPMENT

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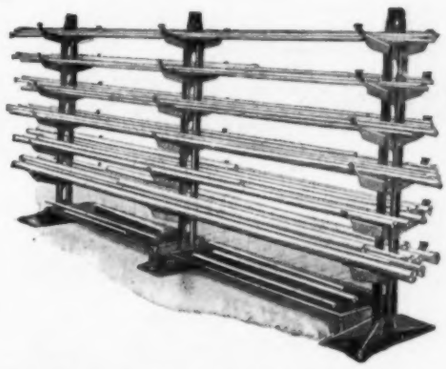
NEW BRITAIN

Bar Stock Rack

for

Conveniently and Economically Storing Bar Stock, Shafting, Piping, Etc.



The New Britain Machine Company

"Shop Furniture Originators" NB New Britain, Conn. U.S.A.

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INVENTORY season may not be the best time to *install* new stock-keeping methods or equipment. But it furnishes a splendid opportunity for *noting needed changes*. For it should be self evident that conditions which occasion delay in the execution of this annual task must extract an unnecessary daily and hourly toll of someone's time throughout the year—time which might more profitably be otherwise spent.

The "New Britain" Rack provides a systematic bar stock storage that is economical both in the floor space taken up and in the time and energy of those responsible for the storing away and removal of stock for use. It eliminates the laborious end hauling and waste of floor space incident to the use of the old-style rack.

Made in double-hook and single-hook (or wall) types, with two, three, or four posts, accommodating 12-ft., 18-ft., and 24-ft. lengths respectively. Enough spaces are provided to allow for a large variety of sizes without mixing.

Full particulars in Bulletin No. 1219.

Edgar T. Ward's Sons Co.

Steel Tube Ward's Tool Steel
Cold Rolled Bar Steel
Cold Rolled Strip
High Carbon or Low Carbon
Gold Label High Speed Steel
MADE BY BRAEBURN STEEL CO.

TEENAX Non Shrinking Tool & Die Steel
(Oil Hardening)
MADE BY BRAEBURN STEEL CO.

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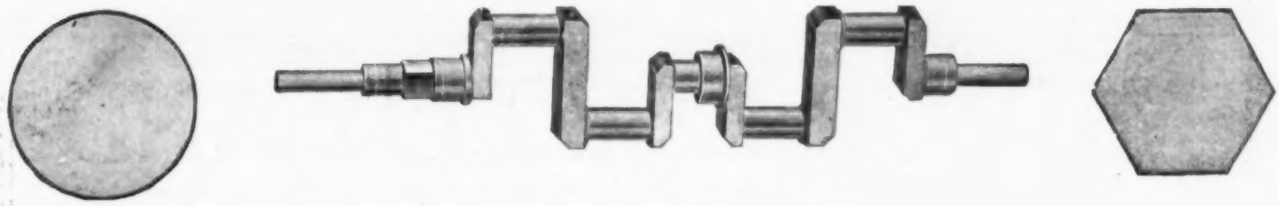


If It's Steel We Can Make It

OUR steels meet every requirement. Our facilities for producing on an economy basis, our specially designed and constructed appliances for guaranteeing accuracy as to form, have given the name STANDARD to our product.

Our compressed steel flats, rounds, squares, hexagons, channels, angles and special shapes are finished to micrometer measurements; have sharp corners, parallel sides and are perfectly straight. We can give reasonably prompt shipments on Finished Shafting up to and including 6 cu.in. diameter.

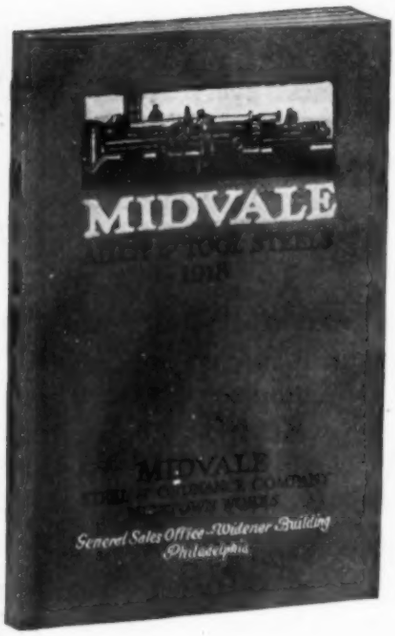
Cold Drawn Screw Stock is our specialty. It is accurate to size and guaranteed to be free cutting. Suitable for use in high speed automatic screw machines.

Our crank shafts and connecting rods of any grade steel desired are preferred by the largest and most representative manufacturers in this country. We need say nothing further as to their quality and finish. Machine keys, machine racks, feed screws, lead screws and worms —any style, size or quantity, but of STANDARD quality only.

Send for our list of steel specialties and learn how well we can serve you. Do it right now.

Standard Gauge Steel Co.
Beaver Falls, Pa.

MIDVALE ALLOY AND TOOL STEELS



(*A* HANDBOOK, *not merely a Catalog*)

has been one of our most popular publications because it tells not only what steel to use, but the proper methods of handling, treating and the results that can be obtained. A unique and successful feature is the inclusion of a set of curves showing the critical temperatures and physical properties of all the steels listed. Do you have a copy? If not, our nearest district office will be pleased to supply you with one.

MIDVALE STEEL AND ORDNANCE COMPANY
CAMBRIA STEEL COMPANY

General Sales Office, Widener Building, Philadelphia, Pa.

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CONSOLIDATED STEEL CORPORATION, 165 Broadway, New York, is the sole exporter of our commercial products. Address all export inquiries to them.

Series. Number 13-G.

Columbia Steel & Shafting Co.

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EASTERN SALES DEPARTMENT AND WAREHOUSE: BOSTON, MASS.

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THE LARGEST AND MOST COMPLETE STOCK OF COLD FINISHED STEELS
Monthly Stock List Issued

COLD DRAWN SPECIAL SHAPES

Angles, Tees, Cutter Bars, Knife Backs, Bevel Edge and Cam Sections, Typewriter, Automobile and Special Machine Part Sections

We are prepared to furnish, in the shortest possible time consistent with perfection in quality, a great many special shapes in accordance with specifications furnished. The accompanying illustrations will convey some idea of the irregular shapes we have made. The illustrations are intended only to show possibilities in the line of cold-drawn steel bar special shapes for manufacturing purposes.

Inquiries should be accompanied by drawing or sample section (the latter preferred), together with advices as to grade of material required, or the purpose for which it is to be used, and quantity involved.

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TOOL STEELS

Blue Chip

High Speed
and other
FIRTH-STERLING TOOL STEELS

THE knowledge, experience and skill of SHEFFIELD combined with the best PITTSBURGH practice have made these steels the standards of QUALITY and UNIFORMITY wherever Tools are used

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NEW YORK BOSTON PHILADELPHIA CLEVELAND
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"The Steel with a Reputation"

DOUBLE **MUSHET**

TITANIC
Carbon Tool Steel

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Mushets' Special
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Cut Your Heating Costs Use Eclipse Steel Pots

ECLIPSE Pressed Steel Pots and Containers have many advantages over the cast-iron type. The furnace has a greater capacity when fitted with a steel pot. Drawn steel pots have the same sectional dimensions throughout their entire length, while cast-iron pots must be made much smaller at the bottom. The metal in the steel pots is thinner and offers much less resistance to the passage of heat than the heavier cast-iron pots. Other advantages of Eclipse Seamless Steel Pots are their high melting point and special composition which prevents corrosion and the permanent growth which destroys cast iron exposed continuously to high temperatures.

Eclipse Steel Pots quickly pay for themselves in gas savings. Write today for Circular giving a complete description.

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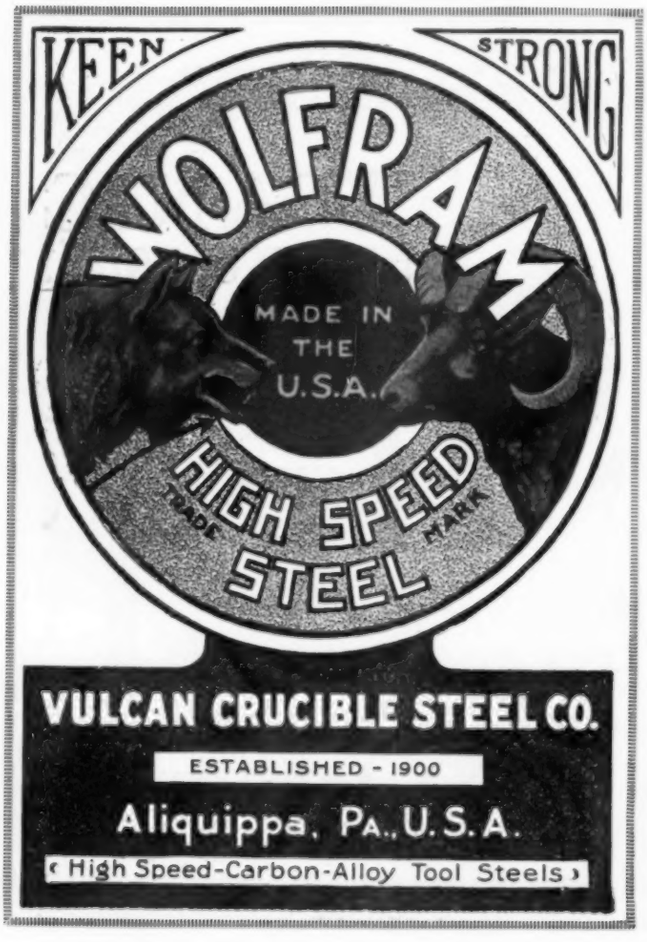

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‹ High Speed-Carbon-Alloy Tool Steels ›

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Makers of Bright Cold Finished Bessemer, Open Hearth and Crucible Steel, in Rounds, Flats, Squares, Hexagons and Special Shapes; straight, accurate to section, with polished superior wearing surface; for Shafting Duplicate Shafts for machine construction, piston and pump rods, keys, feathers, slides, and guides; Special, simple and alloyed steels, cold finished, for all special requirements, particularly adapted for rapid machining in screw machines, hand or automatic.

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99.84 per cent. pure iron. Uniform composition unsurpassed by any imported product. Two kinds of ARMCO Rods, one for electric and one for oxy-acetylene, handle all steel and iron welding. Flow freely and make toughest possible joint. Send for booklet of handy welding data.

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Alternating Current Electric Arc Portable Guaranteed Machines

We have machines for all kinds of work, and can show economy over other systems. *Recommended for the following work:*

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(Especially tanks requiring absolute tightness)

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(Especially the introduction of odd-shaped tees and branches)

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Women and machine work—the smooth easy work, the extra cutting qualities of Colonial High Speed Steel are some of the factors that make this possible.

Wherever metal is to be cut at high speed, wherever ultimate economy is considered—there Colonial fulfills the requirements.

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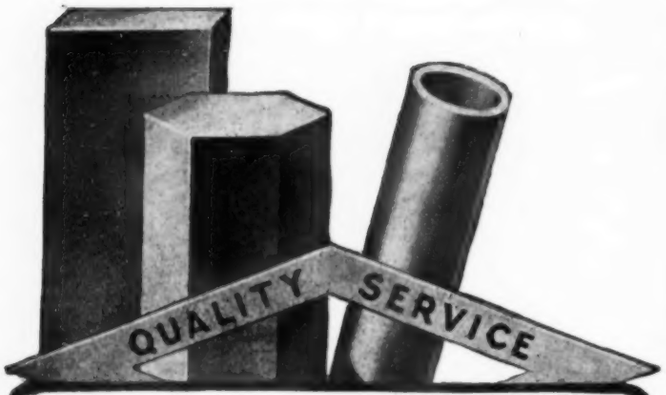

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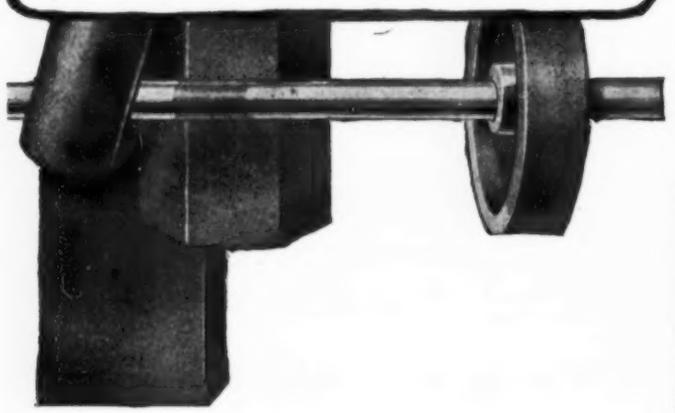

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Save your High-Speed Steel Scrap
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STEEL

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With URANIUM in it—

is far superior to ordinary high speed steel for heavy turning operations, etc., than the ordinary high speed steel. Electrite Uranium High Speed Steel has uranium mixed in it, in proper proportions by experienced metallurgists, thus adding unusual strength and toughness for all requirements.

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QUALITY
Plus the Square Deal

We have found from the experience of nearly 150 years that it PAYS US to use the best raw materials available and to put into effect the most progressive and painstaking methods in producing the tool steel that it PAYS YOU to use.

Jessop's Tool Steel

is good tool steel. When a better tool steel is made Jessop will make it.

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The Steel that gives the cut

Unsurpassed for special endurance, great strength and toughness. For turning, planing and slotting hard materials; for expensive Cutters, Drills, Forming Tools, Taps, Reamers, Punches, Dies, etc.

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"KETOS"
An Original Product

No other steel put on the market since Huntsman invented the crucible process, early in the eighteenth century down to the present day, so successfully blends toughness, durability, cutting-power, density of structure, non-shrinking and non-warping properties, and, above all, safety in hardening, as does "Ketos" Oil Hardening Tool Steel.

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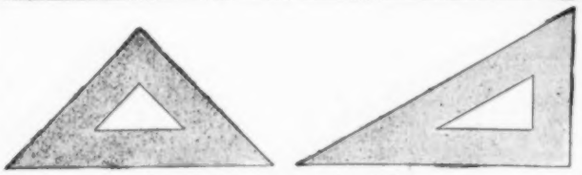

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Non-corrodible—strong as steel—tough and ductile. Withstands acids, high temperatures, erosive action of hot gases and superheated steam.

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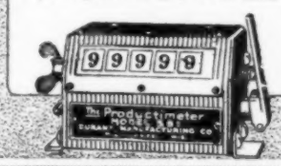
Labor losses occur from over-runs, slow operation, miscounting, dissatisfied workers, and lack of uniform standards.

By knowing, accurately, any minute, just how each job and each operation stands, these losses and bad conditions can be stopped. The Productimeter will do it. Tell us your problem and we'll send one on 30 days' approval.



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Oxy-Acetylene Welding and Cutting Apparatus
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Highest efficiency in results and greatest economy in operation. Both gases under independent pressure; positive mixture; high pressure torch and neutral flame. Complete Plants for greatest requirements. *Write for* **Catalog, Bulletins and Supply Price List.**

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SHAFTING — SPECIAL SHAPES
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NEW ENGLAND DRAWN STEEL CO.
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Hardening and Annealing

The heat-treatment of your product is a big factor which should be given your most careful attention.

American Gas Furnaces

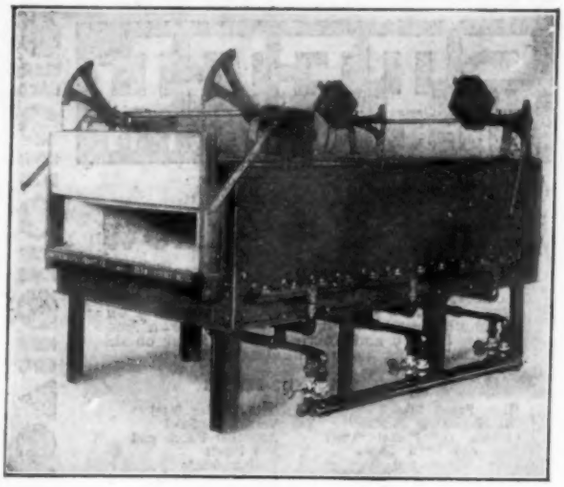
are the most economical and efficient furnaces for every heat-treating requirement. They consume gas as a fuel, for gas permits accurate regulations of temperature so essential for producing high quality work. American Gas Furnaces are extensively used in the most prominent manufactories where quality dominates.

We make gas furnaces for every requirement. Let us estimate on your installation.

AMERICAN GAS FURNACE CO.

Gas Engineers and Manufacturers

24 and 26 John Street, New York City



Our Line Includes: Pressure Blowers, Gas Blast Furnaces, Heating Machines, Blow Pipes and Burners, Case Hardening Machines, Rotary Annealing Machines with Sealed Retort, Coloring and Tempering Machines.

No Sharp Corners

The Gray & Prior Universal Joint is mechanically perfect in load transmission. Friction and wear is minimized by eliminating screws and small parts and by rounding contact edges. Circular upon request.

The Gray & Prior Machine Co.

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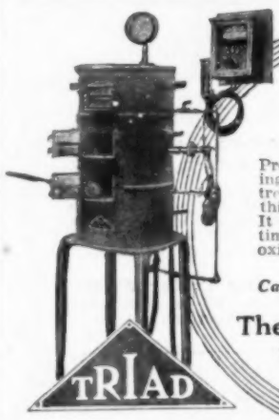

The 3 Purpose Furnace

Preheating, Hardening, Tempering—you can perform all three treatments with one burner with this economy furnace—the Triad. It saves fuel, floor space, labor, time and avoids the danger of oxidizing tools under treatment.

Catalog 10 gives full particulars

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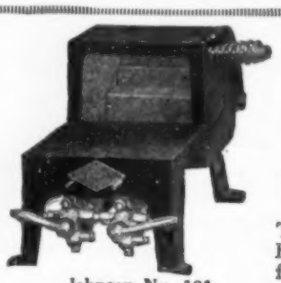

Johnson No. 101

1800° Fahrenheit Without a Blower

The Johnson Atmospheric Bunsen does the trick. This furnace will heat-treat taps, dies, reamers or cutters. Will also handle soldering coppers up to 10 lb. a pair. Just the thing for your tool room of tin shop.

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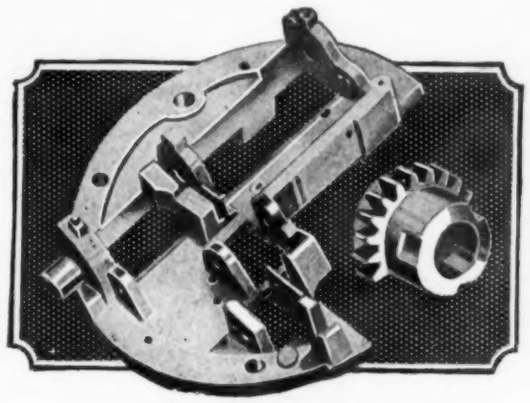

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DOEHLER DIE-CASTINGS

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However intricate the part and however exacting the specifications, your full satisfaction is assured when you entrust the die-casting to Doehler. The products of the Company's plants are standard wherever quality is the essential requisite. Years of specialization have built an engineering staff and a manufacturing organization which stands preeminent in its field.

Put your die-casting problems up to Doehler

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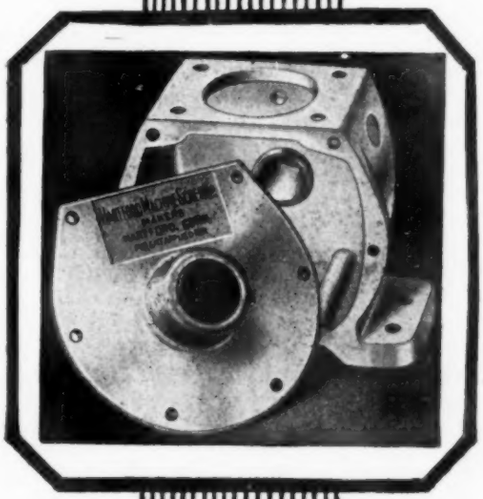

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The use of Franklin Die-Castings is a sound means of improving your product.

As compared with machined parts, die-cast parts mean less finishing, less trouble, less time, less labor, less cost—more uniformity, more dependability, more rapidity of production.

Franklin Die-Castings have been successfully applied to many industries during the last twenty-seven years. They were the pioneer die-castings—and have always been the standard.

We cast in aluminum, zinc, tin and lead base alloys. Quantity deliveries assured.

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CAST "NICHROME" HEAT TREATING CONTAINERS

Carbonizing and annealing boxes, and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles *crack, grow, scale* or *warp,* their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tubes and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars

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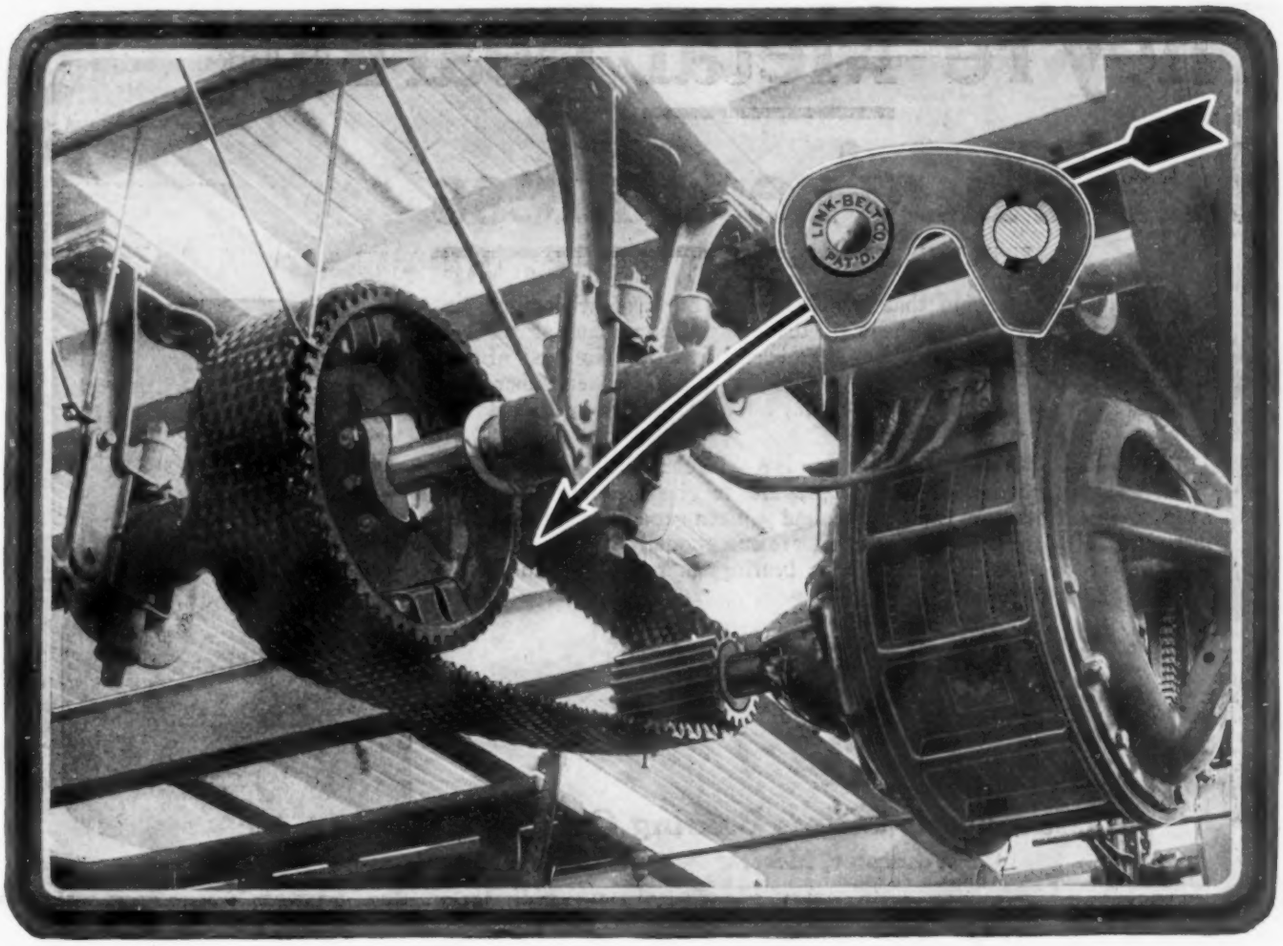

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THIS is the way to transmit power and it is being done every day in modern mills, factories and plants throughout the country by Link-Belt Silent Chain Drives.

Link-Belt Silent Chain Drives transmit all the power of the motor to the machine for useful work without the slippage and constant loss of power so common with leather belts, and without the noise of gearing.

Link-Belt Silent Chain is the ideal method of transmitting power. If you want 98.2% efficiency in power transmission, learn all about the Link-Belt Silent Chain Drive. Write for data Book No. 125.

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LINK-BELT COMPANY

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SILENT CHAIN DRIVES

We Also Make

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A METAL bearing that is oilless—just think of what that means. A bearing made of the best bearing material yet which needs no attention after being installed. No need of remembering to oil, no burnt-out bearings if you don't remember, no dirt, grease and grime, no fire risk, no need of drip pans and oil cups.

The C. G. M. Oilless Metal bearing is a skillful scientific mixture of metal alloy and specially treated graphite to give the lubrication. Many different mixtures can be made and you can get a bearing that is just right for every use—bearings that are exceptionally strong, bearings that are conductors of electricity, bearings that will run under water without corroding.

We can give you just the bearing you need, it will be metal, yet oilless.

P-L
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they transmit power SMOOTHLY, SURELY and SAFELY. Lapointe machines pull finely tempered broaches through metal parts—a sudden shock may cause a break—"MULE PULLS" eliminate shocks and consequent breakage.

...akes a pull of a hundred ...
...ds necessary to bring the broach through, a broaching machine must not only have adequate strength and power for such a task, but the power must be exerted skilfully A broach is a delicately ...ened tool and, while quite

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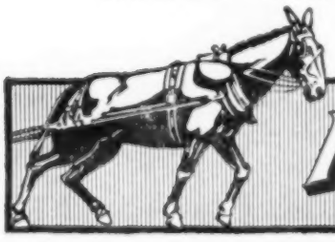
Brown Engineering Company
115 No. Third St., Reading, Pa.

This is an advertisement of the J. N. Lapointe Co... with an illustration of Mule-Pull Clutches.

2023-N



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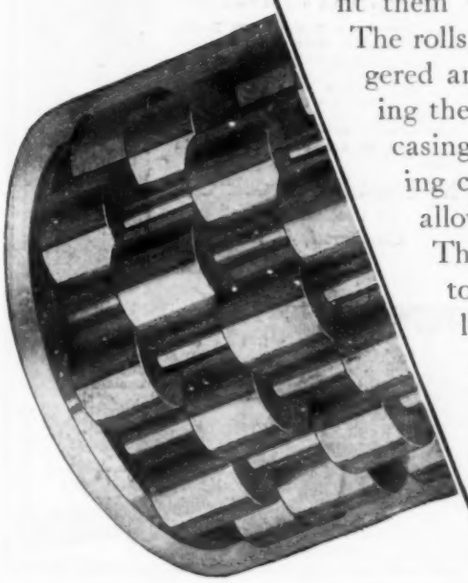

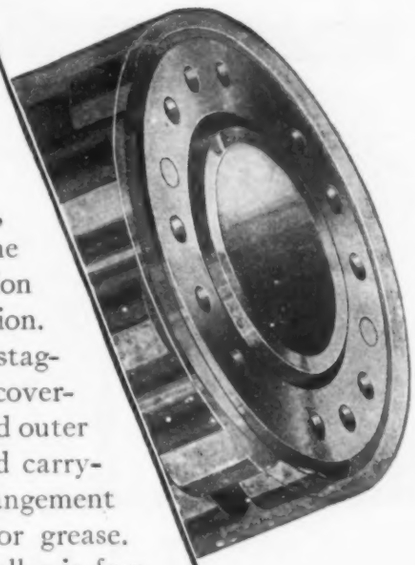

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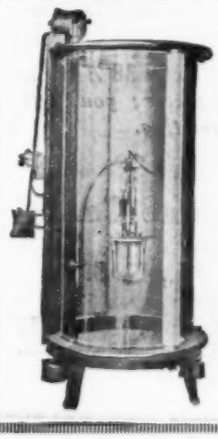

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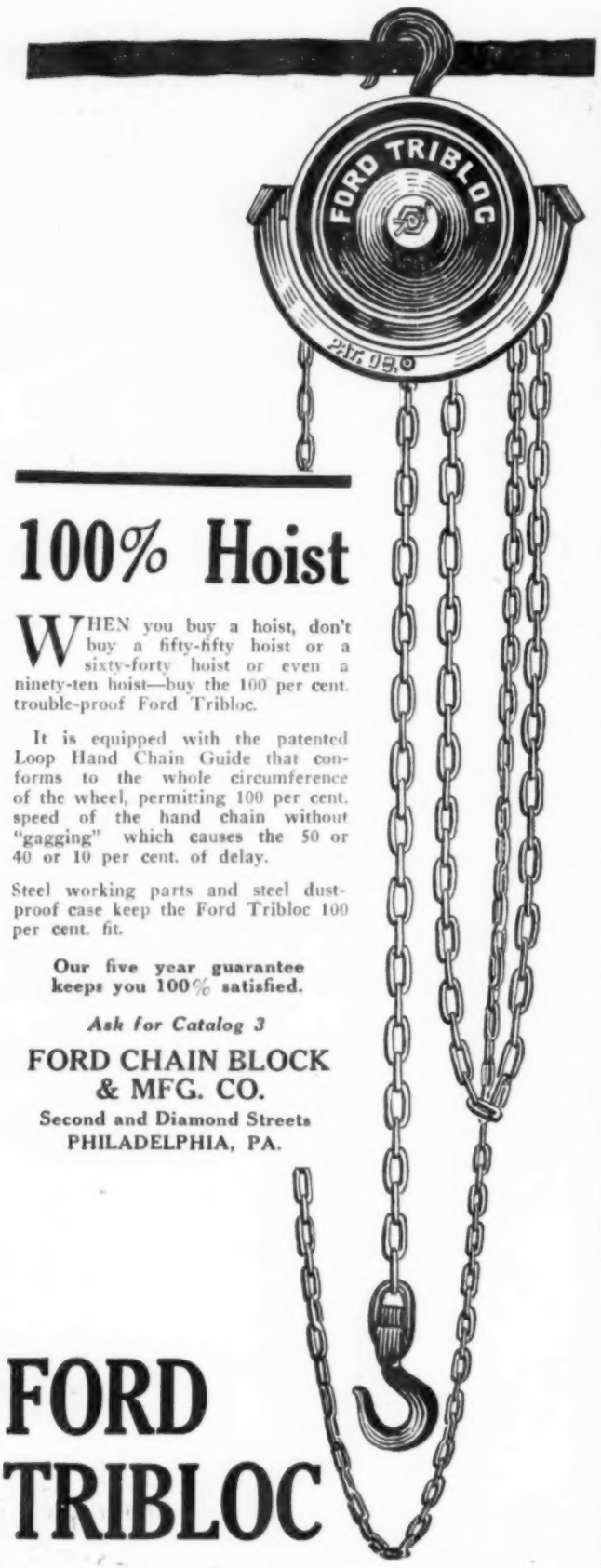

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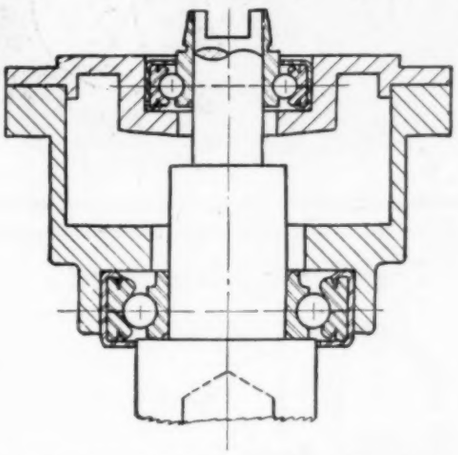

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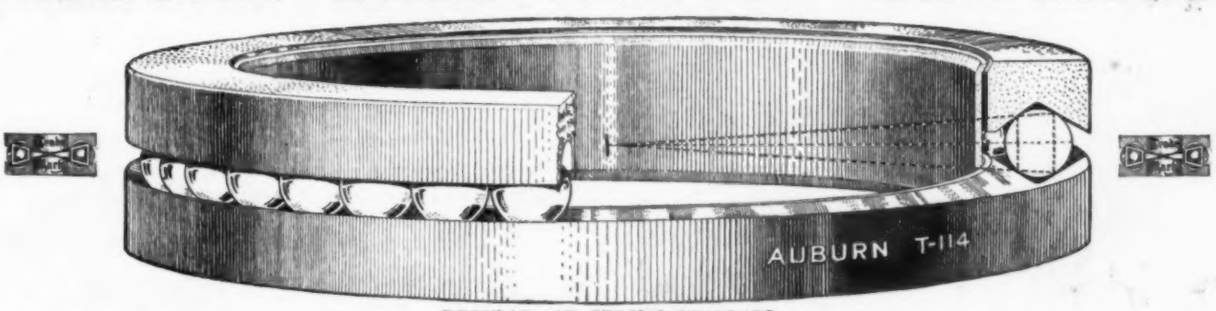

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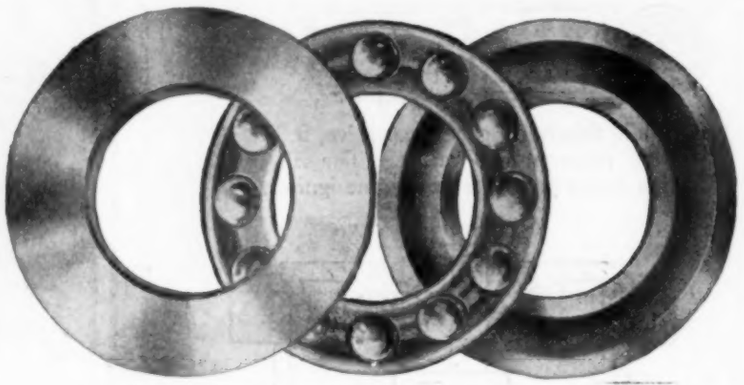

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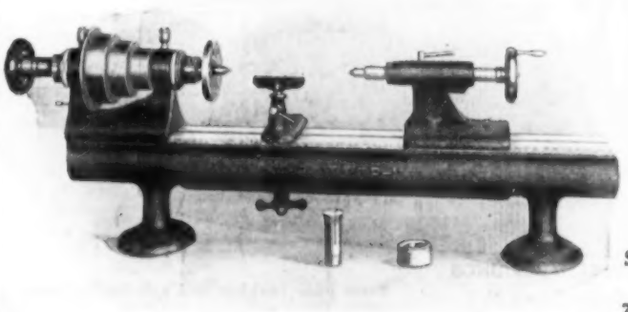

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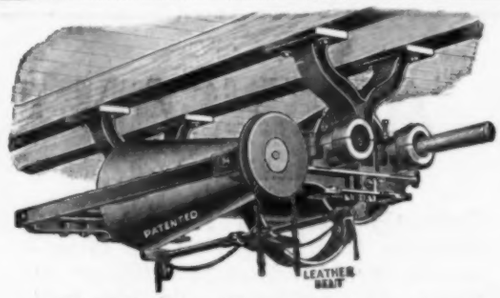

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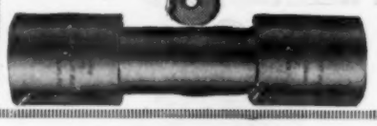

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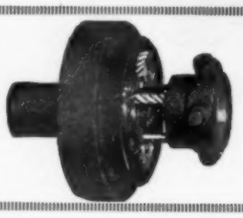

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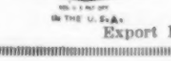

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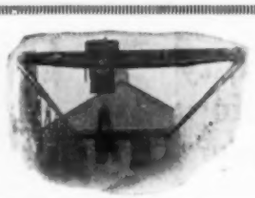

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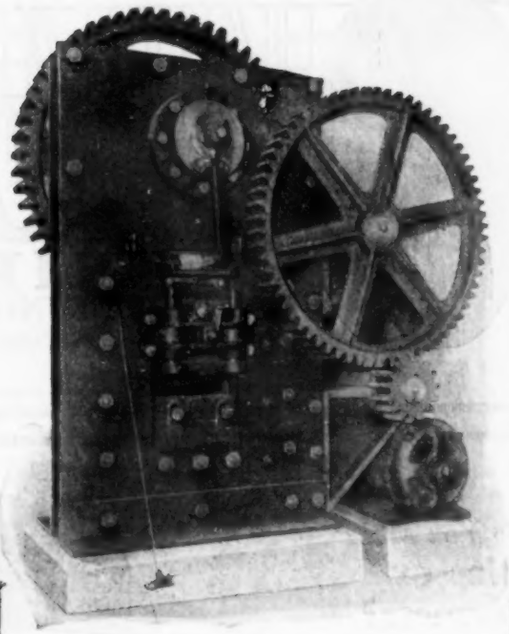

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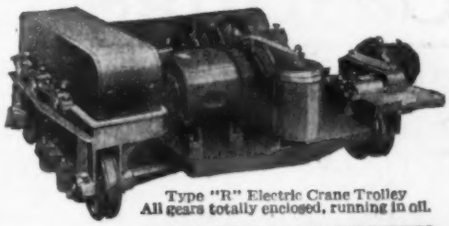

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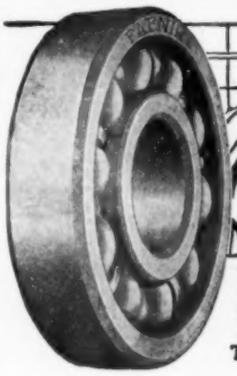

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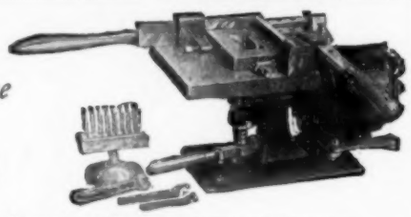

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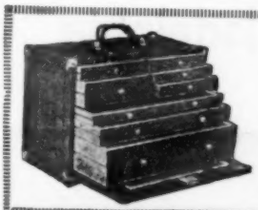
Canadian Factory, Dart Union Co., Ltd., Toronto.
Ask your dealer for prices.



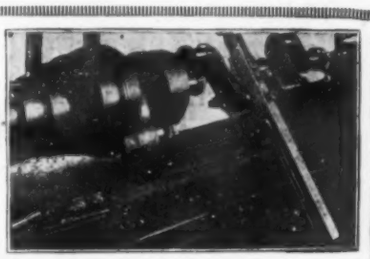
START TO ECONOMIZE

It costs considerable to replace lost and ruined tools. Get a "Gerstner" Case and you'll be money in at the end of the year. Select one from our free catalog showing many styles of guaranteed Tool Cases. **Write for Catalog.**

Gerstner & Sons. Manufacturers of Mechanics' High Grade Tool Cases

25-31 Columbia St., DAYTON, OHIO

No Filing
No Offsetting
No Jigs



The Weber Tool turns ALL Pins from ONE setting of the Crank Shaft, ON CENTERS. The tool is so constructed that it must turn a Round Pin. The cutter used is a Forming Tool, cutting entire width of pin at once. A micrometer dial enables operator to gauge his cuts and turn all pins to a uniform size.

Weber Crank-Pin Re-Turning Tool

How many times have you assembled a gas engine, knowing full well that the crank shaft needed trueing up? You did not want to send it out and delay your customer. You knew, too, that it would cost considerable to have it done.

With the Weber Tool *you can do* this work whenever necessary. NO DELAY—NO EXPENSE.

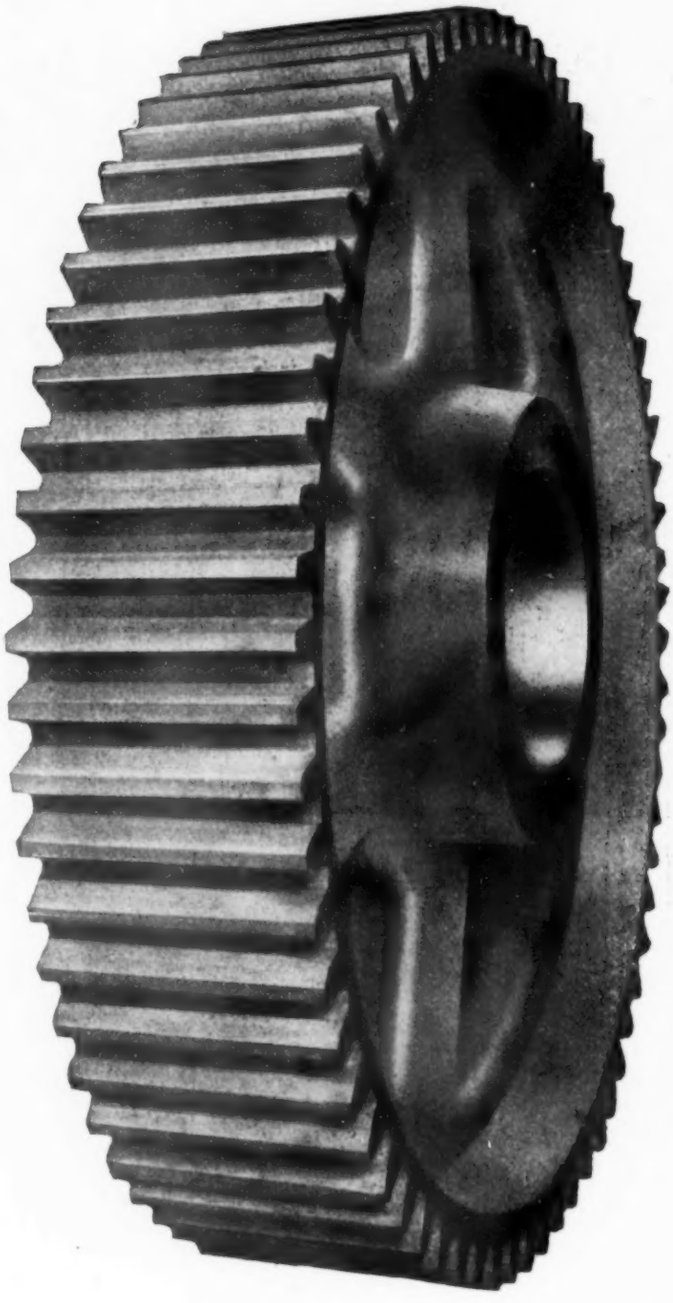
Why not do this work *in your shop* and have more satisfied customers and put *more profits* in your own pocket?

SAWYER-WEBER TOOL MFG. CO. TOOLS OF SW ACCURACY WEBER RE-TURNING METHOD LOS ANGELES CHICAGO

The Weber Tool is guaranteed to turn crank-pins within as close limits of accuracy as any other known method.

Picture at top shows Weber Tool in operation on 4-throw Crank Shaft. All four pins are turned and finished from this one setting. Write for Circular and prices.

SAWYER-WEBER TOOL MFG. CO.
348 South Alameda Street
Los Angeles, Cal.



He Called Up Phillie and Was Shocked Silly

This customer had had a breakdown and was in a dickens of a fix.

He figured it would be a week before he could get a new set.

Someone suggested that he try Phillie Gear.

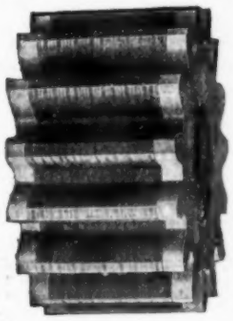
Getting P. G. on the wire, he was thunder-struck when that famous Gear Man said the gears could be shipped in 24 hours. He had never dreamed of such service.

Maybe a like service would help you out of a hole NOW. How about it?

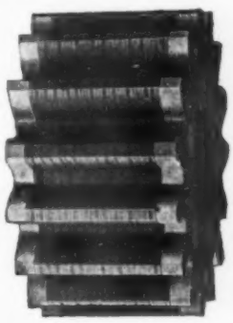
Also, how about a copy of the Phillie Gear Book?

Philadelphia GEAR Works 1120-1128 Vine St. Philadelphia

The money loss caused by the use of certain noisy machinery was the argument advanced by a prominent mill superintendent as reported editorially in Chemical & Metallurgical Engineering. Here are his views:



"Din is responsible for many misunderstood directions and orders to employees, resulting in confusion, loss of time and expensive mistakes. The point is readily perceived. The average mill employee is anxious to give the impression that he understands the boss's orders, and rather than ask a question for further information he will sometimes pretend to understand and then go and seek advice from a fellow workman. The order may be wrongly executed or not at all. Noise contributes greatly to this condition, makes it difficult to give and receive orders, and undoubtedly causes many mistakes. The cost of noise may not be estimated exactly, but it is a real factor."



The worst offenders in these respects are noisy high-speed gear drives which can be quieted at small expense by installing

NEW PROCESS RAWHIDE PINIONS

Improvement in human efficiency is but a small part of the resulting benefit, for quiet gear drives invariably indicate better mechanical conditions also. By cushioning vibration and better accommodating themselves to sudden load variation *new process* RAWHIDE PINIONS make machine parts last longer and lessen danger of breakage of the larger and more expensive companion gear.

These and other important matters are explained in detail in our book "Noiseless Gear Driving," which you should read. A copy is yours on request.

Why risk making your own metal gears when economy, time-saving and protection are promoted by letting us supply you

Put the responsibility up to us and you won't be sending out any gears that "look too good to scrap." These "nearly all right" gears cost as much as good ones when made in your own shops, and take up all the profit. By buying from us you can demand commercial perfection and get it together with fullest protection to the reputation of your product or shop tools.

THE MEACHEM GEAR CORPORATION

Sole manufacturers of new process RAWHIDE GEARS and PINIONS—still made under the direction of the inventors and the men responsible for every stage in their development.

Canal Street and West Shore R. R. **Syracuse, N. Y.**

28

Gears

that "Bring Home the Bacon"

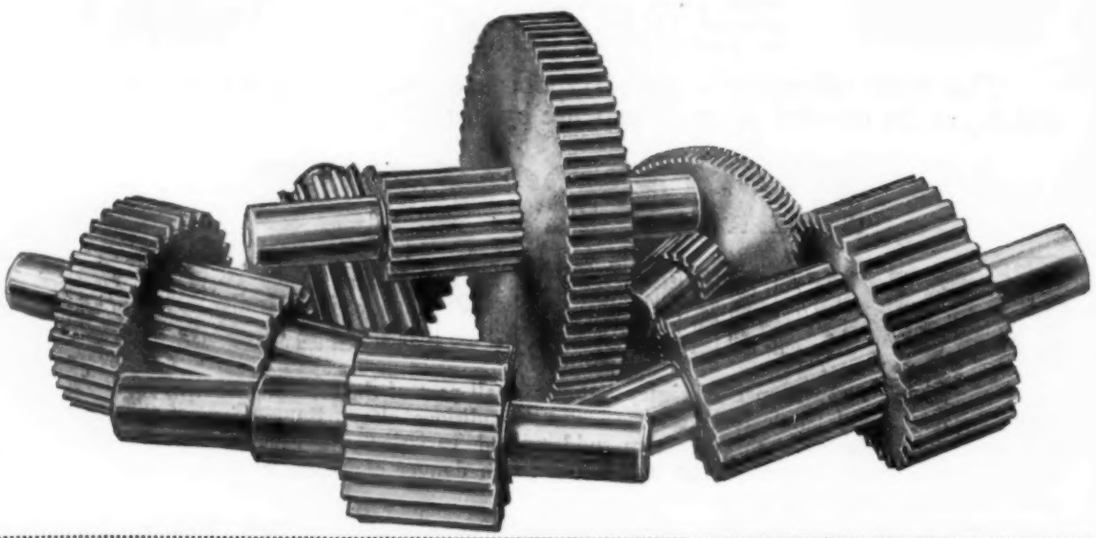
TRUE, there are many reputable gear-makers in this country, and we frankly confess that their product is not vastly different from ours.

But—the shrewd buyer, the machinist who knows his business, will not consider the *gears alone*. He will first carefully scrutinize *the organization behind them*. He will measure it, sound it, examine it, see what others think of it. Then he will place his order.

It is to these people that Jones Service will appeal.

Every gear that leaves our plant is put through without a hitch. The teeth are either hobbed or planed. The material consists of the best iron, steel, bronze, rawhide or Blakelite Micarta that can be purchased.

You can depend on Jones Gears and the service you get with them



W. A. JONES
FOUNDRY & MACHINE CO.

Cast Iron Pulleys, Hangers, Pillow Blocks, Couplings, Lemley Friction Clutches, General Power Transmission Machinery and SPEED REDUCERS
4404 W. Roosevelt Rd., Chicago; 30 Church Street, New York City

STOP Gear Noise

STOP Gear Wear

Do it with

Texaco Crater Compound

The first application proves it is right for the lubrication of gears. You can tell by the way it quiets gear noise. Subsequent applications shows its dependability by the way it "stays put."

Watch it in use a while and note how it eliminates wear and promotes efficient operation.

Texaco Crater Compound does these things because it is so suited to the purpose. It is a pure mineral, all lubricant product that is highly adhesive to metal surfaces, waterproof, and not affected by heat or cold.

Texaco Crater Compound maintains a lubricating film on the gears under all conditions. It is not squeezed out by great pressure nor thrown off by high speed. No wastage on this account in use. One application lasts a long time.

Order a barrel, half barrel or trial can. Save the gears, spare the ears and save money on lubricant. Ask us to tell you more about this great lubricant.

THE TEXAS COMPANY
Dept. A1., 17 Battery Pl., New York City
New York Chicago Houston
Offices in Principal Cities

Offices in Principal Cities
Texaco Petroleum Products Company, Ltd.,
Distributors for the United Kingdom.
Head Office: 22 Billiter Street, London, E. C.

TEXACO FUEL OIL
in various grades suitable for
Forging, Annealing, Heat Treating and **use under Boilers**
—Can be Secured in the territory East of the Rocky Mountains

THERE IS A TEXACO LUBRICANT

FOR EVERY PURPOSE

Foote
DEPENDABLE
Gears

NO matter what your gear requirements may be—whether you require gears for heavy duty or light duty, simple gears or those of unusual practice, large gears or small gears, we can supply you with any quantity in record time.

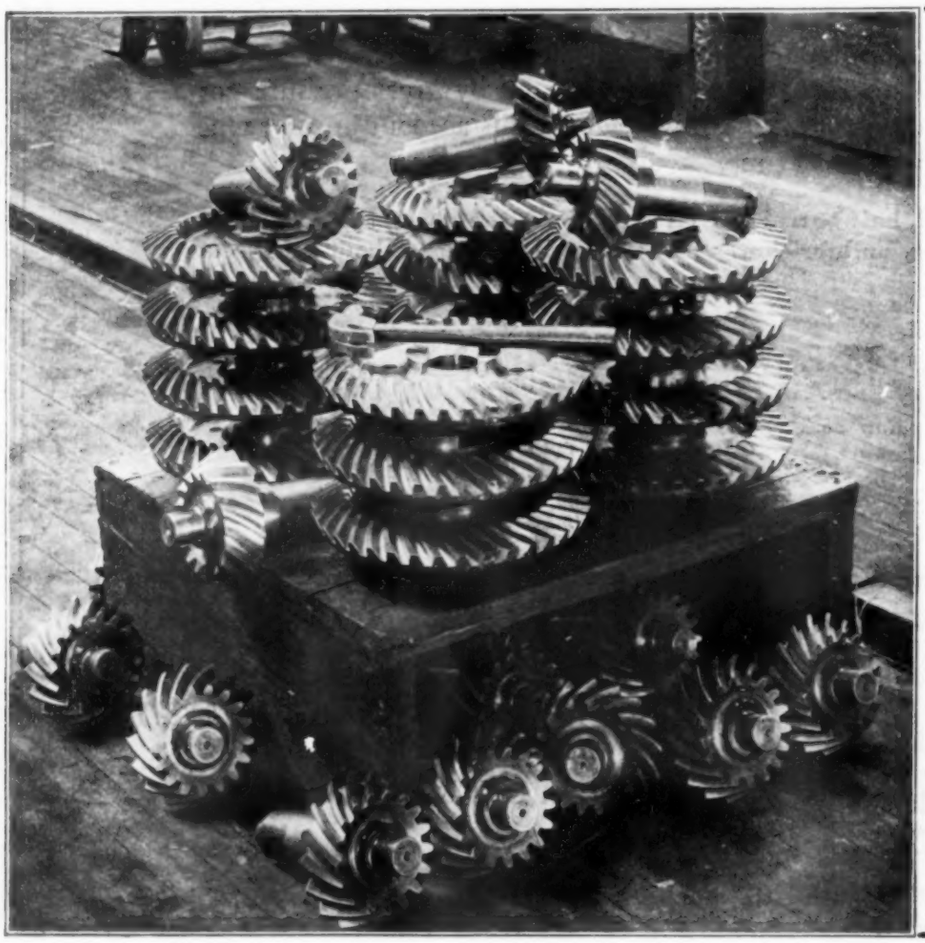
Foote Engineering Service is yours for the asking

Consult Foote Engineering Service. We have been able to show many manufacturers how to get better results and how to cut gear costs. We may be able to indicate big savings for you. This service is yours without cost or obligation. *Write us to-day.*

FOOTE BROS. GEAR AND MACHINE CO.

Manufacturers of Gears of all kinds

232-242 N. CURTIS ST., CHICAGO, ILL.



Spiral Bevel Gears

The demand for these gears is constantly increasing.

Place your order for machines now.

Ask for estimate of production on our Special Spiral Roughing Machines.

Gleason Works
Rochester, N. Y.

Were It Not for Friction, Perpetual Motion Machinery Would Be Running Trolley Cars

OF COURSE, you cannot entirely eliminate friction, but with roller bearings you can reduce it to a point where it uses up a negligible amount of power.

Before the leading industries adopted "Sells" Roller Bearings—while they were still trying out various types of bearings—they found that besides the power they save—

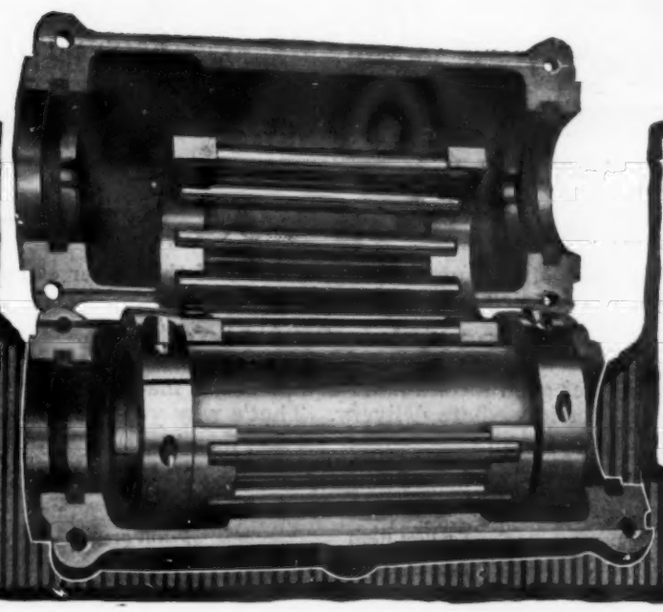
"Sells" Roller Bearings increase the life of belts, machines, motors, gears and other equipment because they reduce the strain to which these are subjected.

Overnight you can cut down the friction load in your plant. "Sells" Roller Bearings are split and can be readily fitted to any standard hanger, post hanger or pillow block. The shaft is protected from all wear by steel split bushings. The rolls run parallel to the box and shaft; there is no end thrust.

If you are ready to take up the question of roller bearings in your plant our Service Department is at your convenience. Or we will send you our book containing a lot of interesting worth-knowing roller bearing facts.

John D. Sells
Manager

Royersford Foundry and Machine Co.
50 N. 5th Street, Philadelphia



Other Royersford Economies.

"Sells" Roller Bearings for mine cars and wagons.

Shaft Hangers, Collars and Couplings.

Rollerine, the Ball and Roller Bearing Lubricant.

Combination Oil and Grease Gun.

Other Royersford Economies.

Babbitted Ring Oiling Bearings.
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Punching and Shearing Machines.
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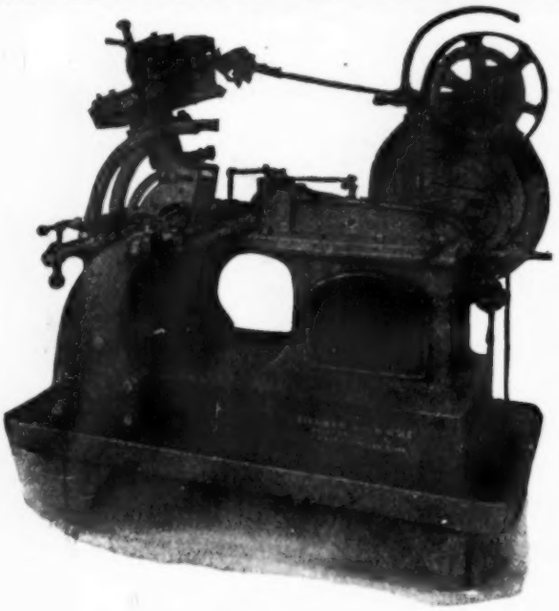
BEVEL GEAR GENERATORS



Bevel Gears

are cut by us theoretically correct, and so are adapted to fine machinery of all kinds. We have special facilities for cutting SPUR, WORM, SPIRAL, MITRE, INTERNAL and ELLIPTICAL Gear Wheels. Let us quote on your specifications.

The Bilgram Machine Works 1233 Spring Garden St. Philadelphia, Pa.

Lea-Simplex Cold Saw

—the cost is surprising in view of its speed

The Earle Gear & Machine Co.
4701 Stenton Ave., Philadelphia

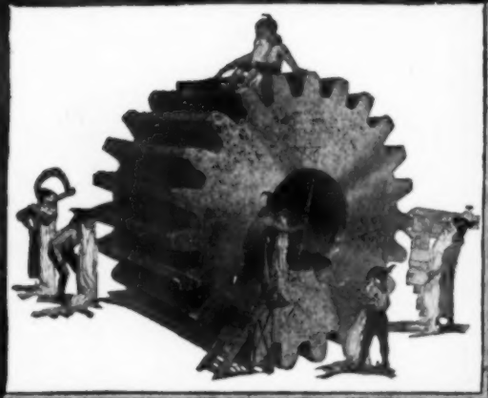
CROFOOT GEARS

Quality
Service

Spurs
Bevels
Mitres
Spirals
Helicals
Worms
Worm Gears

CROFOOT GEAR WORKS
INCORPORATED

31 Ames St. Cambridge "A" Branch
BOSTON, MASS.



GANSCHOW

"QUALITY"
RAWHIDE AND BAKELITE
PINIONS

WILLIAM GANSCHOW COMPANY
CHICAGO ☆ ILLINOIS

If there is anything you want—

or something you don't want that *other* readers of this paper can supply—or use—advertise in the

Searchlight Section

NOW— is the time to offer good second-hand equipment or machinery for sale. The demand is great for good plant for immediate delivery. That's why you should advertise NOW.

NOW— or any other time, use the Searchlight Section for advertising

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35

GRANT GEARS

accurately cut in cast iron, steel, brass, rawhide and fibre.

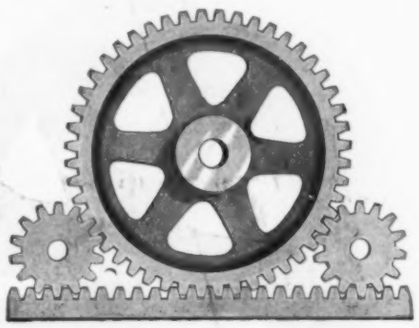
Our large new factory equipped with the very latest gear cutting machinery and a works organization that is backed by 40 years' experience in gear cutting enables us to meet every possible gear requirement from minute pinions to wheels 6 ft. in diameter.

We are prepared to give immediate attention to rush orders and can make prompt shipments on any special type of gearing.

Large stocks of standard cut gears constantly on hand, ready to be shipped at once.

Send us your blueprints for estimate. Let us solve your gear problems.

Write for interesting catalog containing full stock list and valuable gear information.



Grant Gear Works, Inc.
151 Pearl St. Boston, Mass.

PEERLESS
RAWHIDE GEARS

The Horsburgh & Scott Co.
Cleveland, Ohio

B & S GEARS

Accurate and Trustworthy GEARS

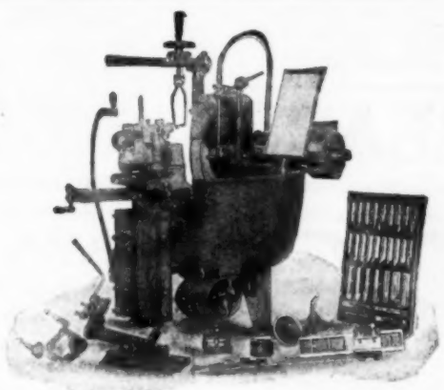
WE were pioneers not only in gear cutting but in the work leading up to the perfecting of gear cutting machinery, gear cutters, etc., and our efforts have always been directed toward the development of precision and reliability in gears.

We are equipped to render valuable service in the cutting of all varieties of gears.

Catalog of Standard Gears
On Request

Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

FOR THE EFFICIENT TRANSMISSION OF POWER



William Sellers & Co. Incorp.
Philadelphia, Pa.

The Sellers Tool Grinder

because of its large output, accurate work, and low cost of maintenance, is regarded as indispensable wherever used. For quickly, correctly and economically forming and grinding cutting tools for Lathes, Planers, Slotters, etc., it has no equal.

Saves Both Time and Money

SHAFTING LABOR SAVING MACHINE TOOLS INJECTORS

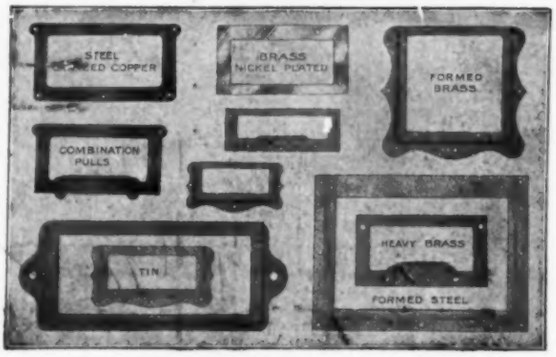
No Gear Too Large

No matter how big the gears you want may be, we can make them for you. We are specialists in the cutting of large worms, odd size gears of every kind and special shapes. We take care of the smallest sizes too, and our service on both is exceptional. Write for quotations and be convinced.

Newark Gear Cutting Machine Co.

HENRY E. EBERHARDT, President
69 Prospect St., Newark, N. J., U. S. A.

KALES STAMPINGS



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BUY DIRECT

We manufacture 23 different styles of card and bin tag holders and pulls.

SAVE TIME AND ANNOYANCE by using Kales Card Holders to properly classify your stock, so you can find what you want when you want it.

Send for our Catalogue and Price List

KALES STAMPING COMPANY
453 West Lafayette Blvd., Detroit

"Zones of Quiet"

Albaugh-Dover accurately generated Gears are real "ZONES OF QUIET"—unusually smooth and noticeably silent in operation. If you use gears, send us your Blue Prints or Sample Gears for estimates.

ALBAUGH-DOVER CO.
2100 Marshall Blvd., Chicago

GEARS

GEARS

BEVEL—SPUR—WORMS—SPIRAL
Up to 60 inches

We solicit your inquiries

THE TAYLOR MACHINE CO.
Cleveland, Ohio

ALBRO-CLEM HINDLEY GEARING
WILL DO THE WORK
When Common Worm Gearing Fails
ALBRO-CLEM ELEVATOR CO.
503 Erie Ave., East, Philadelphia, Pa.

CULLMAN
Sprockets and Chains
In stock and to order. Send for Catalogue.
CULLMAN WHEEL COMPANY
1349 Altgeld St., CHICAGO, ILL.

Automatic Gear Cutting Machines

Spur
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Bevel **GEARS** Cut To Order

THE FLATHER MFG. CO.
FLATHER
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FAWCUS HERRINGBONE GEARS
Mill Drives . Turbine Transmissions
Spur Gears . Bevel Gears . Worm Gearing
FAWCUS MACHINE COMPANY, PITTSBURGH, PA.

M-C

GEARS
are accurately generated on our hobbers.
Let us cut your gears.

Meisselbach-Catucci Mfg. Co.
28 Congress Street **Newark, N. J.**

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BOSTON GEARS

The World's Standard

1200 SIZES IN STOCK FOR IMMEDIATE DELIVERY

Send for 1919 catalog giving sizes and list of stores that carry a stock

GEARS TO ORDER IN LARGE QUANTITIES A SPECIALTY

BOSTON GEAR WORKS MAIN OFFICE AND FACTORY NORFOLK DOWNS, QUINCY, MASS.

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"FULFLO"

—the brief way to specify *the* Troubleproof Lubricant Pump. Thousands have been convinced by test. Let us show you. Easily attached to any machine in your shop.

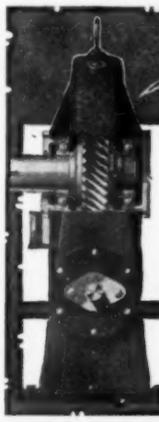
The Fulflo Pump Co., Blanchester, O., U. S. A.

Reduce Your Engraving Costs

A Gorton Engraving Machine will greatly reduce your engraving cost. It is a rapid, accurate machine that can be operated by any inexperienced boy or girl and which will give results equal to the most skilled hand engraver. Think of the saving and the increased output.

Geo. Gorton Machine Company
Racine, Wisconsin

SPEED REDUCTION



Upon the right medium for reducing speed often depends the efficiency of an entire organization.

Data Book No. 1 tells all about Cleveland Worm Gear Reduction Units.

Write for Data Book No. 1.

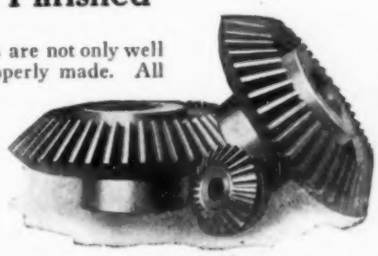
THE CLEVELAND WORM GEAR CO.
"America's Worm Gear Specialists"
CLEVELAND, OHIO

SEARCHLIGHT SERVICE SECURES SATISFACTORY SITUATIONS SALES

816

Carefully Made, Accurately Cut Completely Finished

Carpenter-Tew gears are not only well designed but are properly made. All the skill and knowledge of 30 years' experience goes into every gear.



Write us today for estimates.

CARPENTER-TEW GEAR COMPANY
Bush Terminal, Brooklyn, N. Y.

Every Tooth Does Its Bit

There are no "slackers" among Cincinnati Gears. Every tooth is "up and at 'em" when the "push" begins.

We put Cincinnatis through such a rigid "physical" test that none except the absolutely fit ever reach the front.

CINCINNATI SERVICE

awaits your pleasure in the matter of bevel, mitre, spur, spiral, internal and rawhide gears, worms and worm wheels. It is quick, reliable and justly priced. Get our Catalog "C."

Cincinnati Gear Co., Cincinnati, Ohio

SWEETLAND CHUCKS

are Not in League with the Scrap Pile

METAL turners will tell you that the ordinary lathe chuck has no equal as a "fattener" of the scrap heap. The uneven gripping power of the jaws distorts, fractures or mars the work. On many the working parts so protrude as to interfere with the workman's freedom of operation, also that of the cutting tools. You will further find that most chucks are not properly reinforced at the points of strain and spring under heavy cuts, throwing the work out of "true." Sweetland Chucks possess *none* of these drawbacks. They were designed by engineers to produce accurate metal turning, and to produce it over long periods under severe strain. We have literature that describes them in detail and you will appreciate their superior features.

Send in your name for our mailing list.

The Hoggson & Pettis Mfg. Co.
New Haven, Conn., U. S. A.

Cushman Chucks

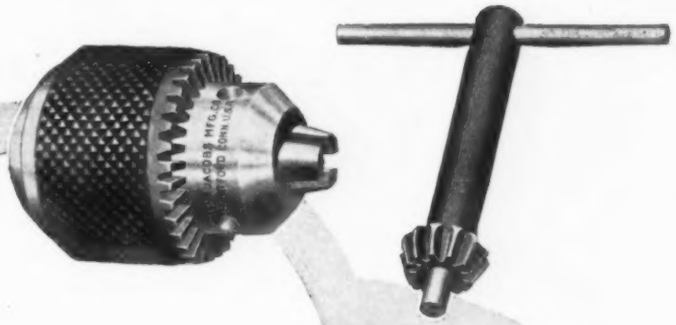
For Holding Bar Stock

Where exceptionally strong gripping power is required, such as on cutting-off machines this "Cushman" Extra Heavy Universal Chuck surpasses all others. Note its extra long grooved jaws with the teeth. The teeth and groove prevent the stock from slipping either way.

Let us send you our catalog which describes our complete line of high grade chucks.

Cushman Chuck Co.
Hartford, Conn.

Jacobs Chucks



as regular equipment

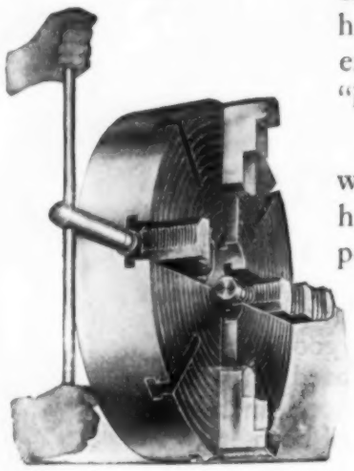
Arnold Electric Drills—"Drills that Drill"—meet the market demand by fulfilling the market's needs. They have made drilling a more precise and certain operation.

The Jacobs Improved Drill Chuck is regular equipment on all Arnold Electric Drills. One good staple product associated with another equally good increases the reputation of both.

The Jacobs Mfg. Co.
Dept. A.M.
Hartford Connecticut
U-S-A-

JACOBS CHUCKS
are standard equipment on
GILFILLAN PORTABLE ELECTRIC DRILLS

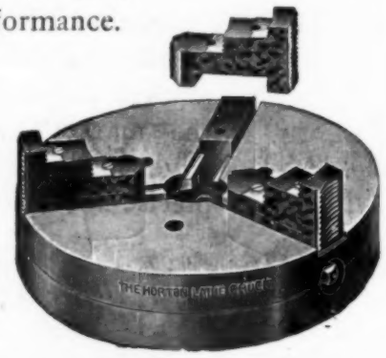
If You Want To Be Sure of Your Chuck Go To "HORTON" For It



You can always depend upon a Horton chuck, no matter what style or size it is. Behind every Horton is over sixty years' experience in chuck manufacture—sixty years of "knowing how."

Horton chucks have been proving their worth during all these years. Manufacturers have learned to know that they can be depended upon for quality and performance.

Write for our catalogue No. 16.
It is full of interesting facts.



THE E. HORTON & SON CO.
WINDSOR LOCKS, CONN., U. S. A.

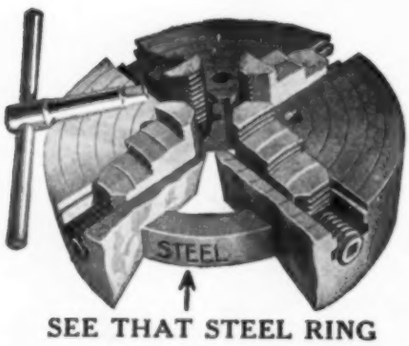
PRATT

Steel Re-enforced Lathe Chuck

THE PRATT CHUCK CO. FRANKFORT N.Y.

ONEIDA

Positive Drive Drill Chuck



SEE THAT STEEL RING

The Steel Ring of the Pratt Oneida Lathe Chuck

is what makes it so strong. Embedded in the iron casting it insures the whole body against the most abnormal pressure. Breakage from strains is impossible.

This ring acts as a brace. It binds the body together and takes up all the strain.

Now Get the Angle on This Drill Chuck

It grips the drill so it cannot slip. Will not lose a fraction of a revolution no matter how high the speed. Eliminates scored drill shanks, worn jaws and replacements.

It means shop economy. Let us tell you more about these two chucks.

THE PRATT CHUCK COMPANY, Frankfort, N. Y.

New York Sales Office and Stock Room: 39 Cortlandt St., N. Y. C. Chicago Sales Office and Stock Room, 557 W. Monroe St.
EUROPEAN REPRESENTATIVES: England, France, Italy and Australia, Selson Engineering Co., 83 Queen Victoria St., London; Russia, the M. Mett Engineering Co., Ltd., Petrograd, Russia.

"Makers of good chucks for over twenty-five years."

Do You?

Most men demand *absolute accuracy* in Thread Gauges. Do you?

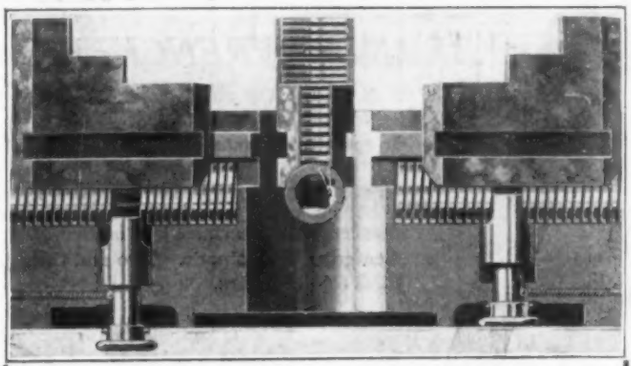
Most men demand that this accuracy in Thread Gauges be *reasonably priced*. Do you?

If your answer to both of these questions is *yes*—then West & Dodge Thread Gauges offer you a mighty interesting proposition.

Their accuracy is absolutely guaranteed and they are priced as reasonably as is possible for a quality product.

Get in touch with us today and let us prove the worth of these tools.

West & Dodge Company
Faneuil Station, Boston, Mass.



The Plungers Make the Quick Action of the Dayton

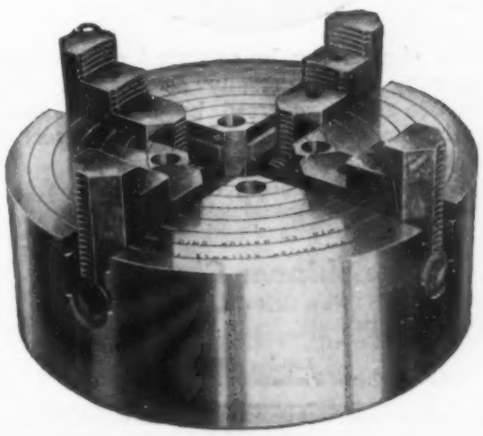
The little plungers shown in the cross section view above are what make the Dayton the quick-acting, valuable chuck it is.

These plungers lock the screw which holds the jaws. To remove the jaws, simply pull down the plunger, and both the jaw and screw lift out with one movement. To reverse, simply turn, set back in and push the plunger up.

Think of the time this will save, of the convenience in cleaning. All danger of stripped threads and jamming is removed.

Send for our literature on this Dayton Quick-Acting Chuck.

Dayton-Reliance Tool & Mfg. Co.
818 E. Monument Avenue
Dayton, Ohio



BARKER WRENCHLESS CHUCK

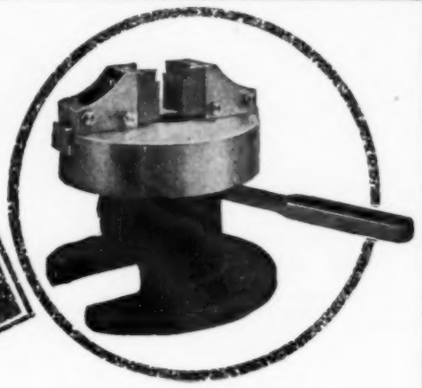
IS displacing the old style chuck in the best shops throughout the world.

It operates *instantaneously*, whether revolving or at rest.

Its grip is actuated by a newly applied principle. It is beyond comparison for power, and it may be controlled while the chuck is in motion.

Centering is automatic. Two and three jaws.

Sizes 6 to 16 inches.



BARKER DRILL PRESS VISE

IS an adaptation of the jaw-operating mechanism of the Barker Wrenchless Chuck for the instantaneous gripping, centering and releasing of work under the drill press.

Adaptable to all classes of regular and irregular work.

Two and three jaws. Sizes 8 to 16 inches.

Send for booklets of complete information.

THOMAS ELEVATOR COMPANY

Chuck Division

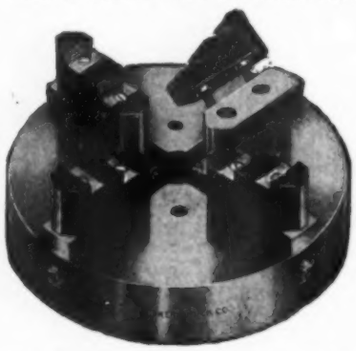
27 South Hoyne Ave., Chicago, Ill.

Branch Office: 328 Park Row Bldg., New York, N. Y.

TC-22

SKINNER

Geared Screw Chucks
3 or 4 Jaws as Preferred.



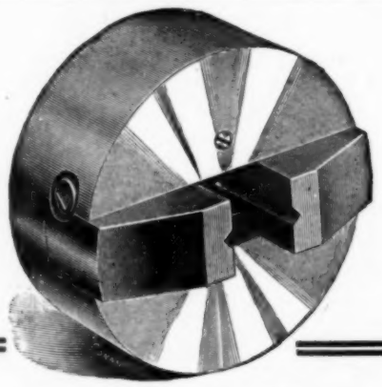
These chucks can be operated either independently or universally as desired. The jaws are easily reversed by simply loosening the jaw screws—turning the upper section and tightening the screws again—

Powerful, accurate, easy to operate and adjust, these chucks are adaptable to many classes of work—

The Skinner Chuck Co.

New Britain, Conn.

New York Office: 94 Reade Street
San Francisco Office: Rialto Building
London Office: 139 Queen Victoria St., London, E. C. 4



Chucks That Last

Note those hardened steel thrust shoulders of this "Whiton" two-jaw chuck. They allow the screw threads to extend fully to the outside of the chuck, giving the jaws greater traverse. This chuck can easily be taken apart for cleaning and will stand up to your requirements against modern high speed feeds and speeds.

May we send you our descriptive Circular?

D.E.WHITON MACHINE CO., New London, Conn.

Europe: Selson Engineering Co., Ltd., 85 Queen Victoria St. London, E. C.

"Whiton" Chucks are sold and kept in stock by principal dealers all over Europe.

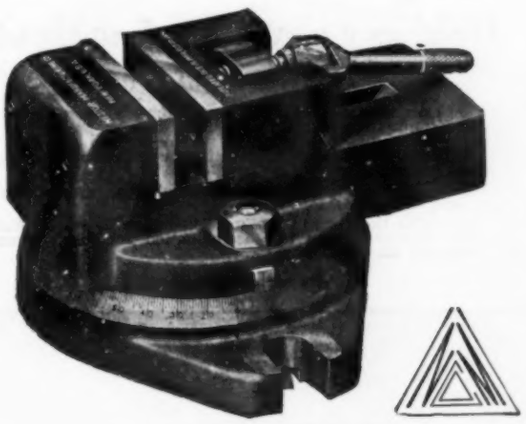
A Most Accurate Milling Machine Vise

The vise itself is most accurate and in addition the base is graduated to aid operators in accuracy.

It is a strong, quick acting vise that will give unusual satisfaction.

Made in four sizes. Send for details.

NESTOR MANUFACTURING CO., Inc.
40 W. 13th St., New York City
Makers also of Nestor Plain Base, Quick-acting Vises



A SOLID DIE WHILE CUTTING, YET OPENS AUTOMATICALLY

Adjustable Gib Slide
Assures PARALLEL THREAD
Closer to Shoulder than
Any Other Opening Die

STYLE F-B

400 half-inch Steel Conduit Connectors **per hour,** cut with **Errington Style "F-B" Rotary Die Head,** after having been adapted for the above work by our Engineering Department. This work has parallel pipe straight thread cut right up to shoulder.

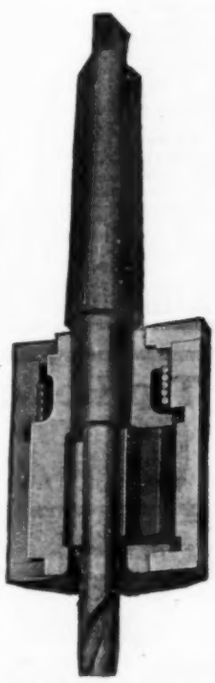
The "Errington" is not only "The Simplest Die That Opens," but the only die that opens and closes while rotating; that can be used on Drill Press, Engine Lathe or Turret Lathe; a Special Tool on **each** job, yet easily adapted to General Work.

Twenty Years' Special Engineering Experience back of each tool to help make a record on your work.

Give us a trial.

ERRINGTON, **41 Cortlandt Street, New York City**
136 W. Lake Street, Chicago
Catalogue Francais: Edgar Bloxham, Paris, 12 Rue du Delta.

Increase the Life of Drills



Use a chuck which grips them by a cam arrangement — grips them firmly without even marring the shanks. Many other types chew up the shanks until the drills become useless.

WAHLSTROM
Automatic Chucks

may be used with positive assurance of safety to the drills. Their grip is as smooth and uniform as it is positive. And Wahlstrom Chucks will soon pay for themselves in the reduced purchase of drills.

We want the Wahlstrom to sell itself. Let us send you one for a practical test. If it isn't better than any chuck you are now using, return it at our expense.

Wahlstrom Tool Company
5520 Second Avenue, Brooklyn, N. Y.

ALMOND

The one-piece body eliminates parts and prevents chattering when under cutting pressure.

The Jaws are made of special alloy steel and hardened through, making them stronger than the usual case-hardened jaws. Two styles of Jaws: No. 1 Common Jaws, No. 2 Reverse Jaws.

OTHER ALMOND PRODUCTS

Drill Chucks, Right Angle Transmission, Micrometer Calipers, Flexible Steel Tubing

T. R. ALMOND MFG. CO.
Ashburnham, Mass.

"Wear-Ever"

The Quick, Positive Spacer for Milling Cutters

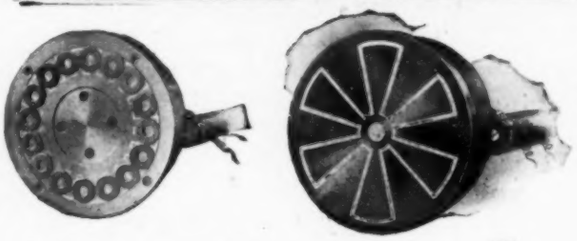
"Wear-Ever" Spacing Collars eliminate the delays between jobs. They have made the old practice of cutting paper shims obsolete in a large, constantly increasing number of big shops.

The "Wear-Ever" collar is adjustable in increments of .002 in. over a range of .024 in. There are no threads to cause trouble; adjustment is positive; faces are always true and parallel. Collar is thin and can be used in close quarters.

Sent on free trial

Scully-Jones Company
649 Railway Exchange Bldg., Chicago, Ill.

THE WALKER LINE



Magnetic Chucks

Hold any shape work without fixtures, etc.

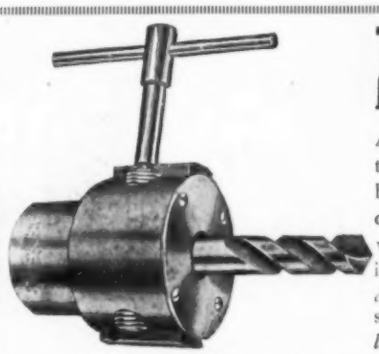
It's the various time-saving devices around a shop that help reduce manufacturing costs. Magnetic Chucks are the latest thing for saving time on surface grinders, iron planers, etc. They hold any shape work in quantities without special fixtures or other expensive devices.

Walker Magnetic Chucks represent the height of progress in design and workmanship.

We also make the famous Walker Grinders with which Walker Magnetic Chucks are an ideal combination for big production and economy on grinding work.

Write for our catalogs.

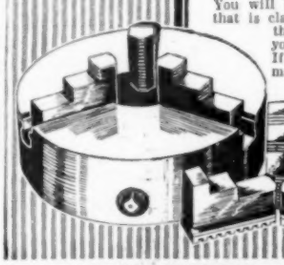
O·S·Walker Co·
Worcester·Mass·
Successors to O.S.Walker & Co. Walker-Grinder Co.



The Union Drill Chuck

A strong and substantial chuck—made of best materials, and a chuck that will wear well under severe service. Also has a *positive drive* feature that will save drills and insures *long life to the chuck.*

Union Manufacturing Co.
26 Cortlandt St., N. Y. NEW BRITAIN., CONN., U.S.A.
Makers of a Complete Line of Chucks



T-W
UNIVERSAL LATHE
CHUCKS

You will find the superiority of T-W all that is claimed when you have experienced their quality. Insist on T-W on your next order.
If your dealer does not handle our make we will supply direct.
Send for a catalog.

TERKELSEN & WENNBERG
Mfrs. of T-W Chucks
326 A St., Boston, Mass., 98-5

A Report On GARVIN Wrenchless Chucks

from a large brass goods plant advises a 50% reduction in cost by the use of these chucks. Is this not worth while investigating at your plant?

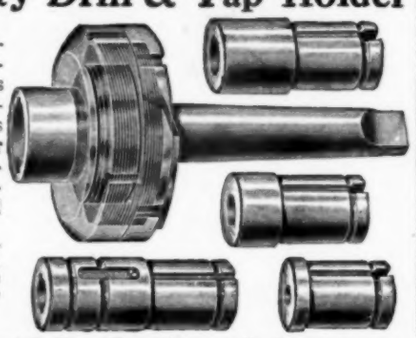
Two and Three Jaw Carried in Stock

For Further Information { Ask Your Dealer or Write Us Direct

Full description in Chuck Catalog.

The Garvin Machine Company
Spring and Varick Sts. 50 Years in New York City

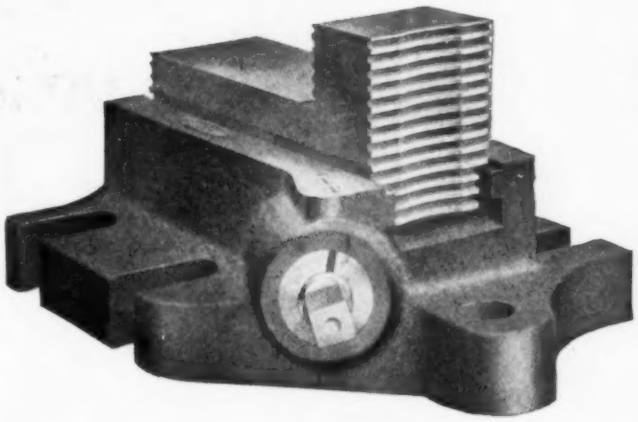
The Safety Drill & Tap Holder



is the only attachment for the purpose that gives universal satisfaction and is **Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.**

Nothing to *break* or get out of *order.* Made in 4 sizes covering from 0 to 2¼ in. diameter.

The Beaman & Smith Co., Providence, R. I., U. S. A.
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed.



BULLARD

Independent Face Plate Jaws

Patented

Type XAP-2

DEVELOPED as a result of a demand for Bullard Jaws to be used in any make of machine. No tongue is fitted to the body, and by means of the provided adjustment of securing bolt centers the jaws are made available for use on machines which do not have the Bullard standard arrangement of T-slots.

The top jaws are made of special chuck jaw steel, which, while very hard, is not subject to distortion or fracture when put into the most severe service. The actuating screw, being placed at an angle with the jaw, gives a powerful differential movement which resists backward strain or tendency to loosen the jaw when under cut, and also permits the operator to use wrench on either end. The jaws are securely held to the slots of table by two bolts, and are reversible. Bases are of forged steel.

Orders should specify XAP-2. Jaws are carried in stock for immediate delivery.

THE BULLARD MACHINE TOOL COMPANY

Bridgeport, Conn.

Scientific Design

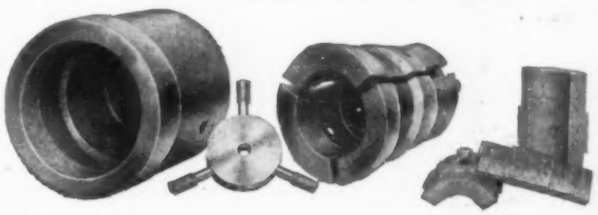
Lavoie Air Chucks

are so designed as to eliminate bulky cylinders on rear of spindles and double lines of air pipe. They grip instantly and release readily by a turn of the valve. Chuck, cylinder and piston form a single unit. Absolutely no gears. Lever and wedge clamping mechanism. Seven types of chucks with six styles of jaws.

Learn all their features. You will appreciate their value in your work.

Frontier Chuck & Tool Company

30 Latchworth Street, Buffalo, N. Y.



For a Certain Grip on Irregular Work

THIS Parallel Grip Collet Chuck holds work the full length of the gripping surface regardless of variations up to ¼ in. in size of taper.

The advantage of this collet over chucks in which the entire length of gripping surface is available only when the work is uniform, is at once apparent.

All parts subject to wear are hardened and ground.

Regular equipment includes Master Jaws with open rear ends.

False Jaws, either blank or shaped to the work, are furnished.

Made regularly with three jaws but can be furnished with two or four—maximum capacities of 2 in., 3 in., 4 in. and 6 in.

We manufacture Standard and Special Air Operated Gripping Devices and Air Cylinders.

American Pneumatic Chuck Co.

9 South Clinton Street, Chicago

Detroit: 2 Goebel Bldg.

REPRESENTATIVES—Eastern Machinery & Equipment Co., Philadelphia, Pa. James Buckley Co., Montreal, Canada. Geo. H. Alexander, Birmingham, England. Aux Forges de Vulcain, Paris, France.

Air Tools

that satisfy the most critical

Railway shops were the first to employ pneumatic tools, and are more familiar with them than perhaps any other class of users; consequently, they are most critical and demand the best that can be had.

The simplicity, ruggedness and power of Little David Pneumatic Tools have won for them a place in over 250 railroad shops alone. The operations shown here require a powerful machine, and Little David is the tool chosen.

Have you a copy of Catalog 8000*?*

INGERSOLL-RAND COMPANY

GENERAL OFFICES, 11 BROADWAY, NEW YORK

DOMESTIC OFFICES

BUTTE, JUNEAU, DULUTH, DENVER, BOSTON, EL PASO, SEATTLE, ST. LOUIS, CHICAGO, NEW YORK, KNOXVILLE, SCRANTON, HOUGHTON, CLEVELAND, PITTSBURGH, BIRMINGHAM, LOS ANGELES, DETROIT, NEW ORLEANS, PHILADELPHIA, SAN FRANCISCO, SALT LAKE CITY, JOPLIN

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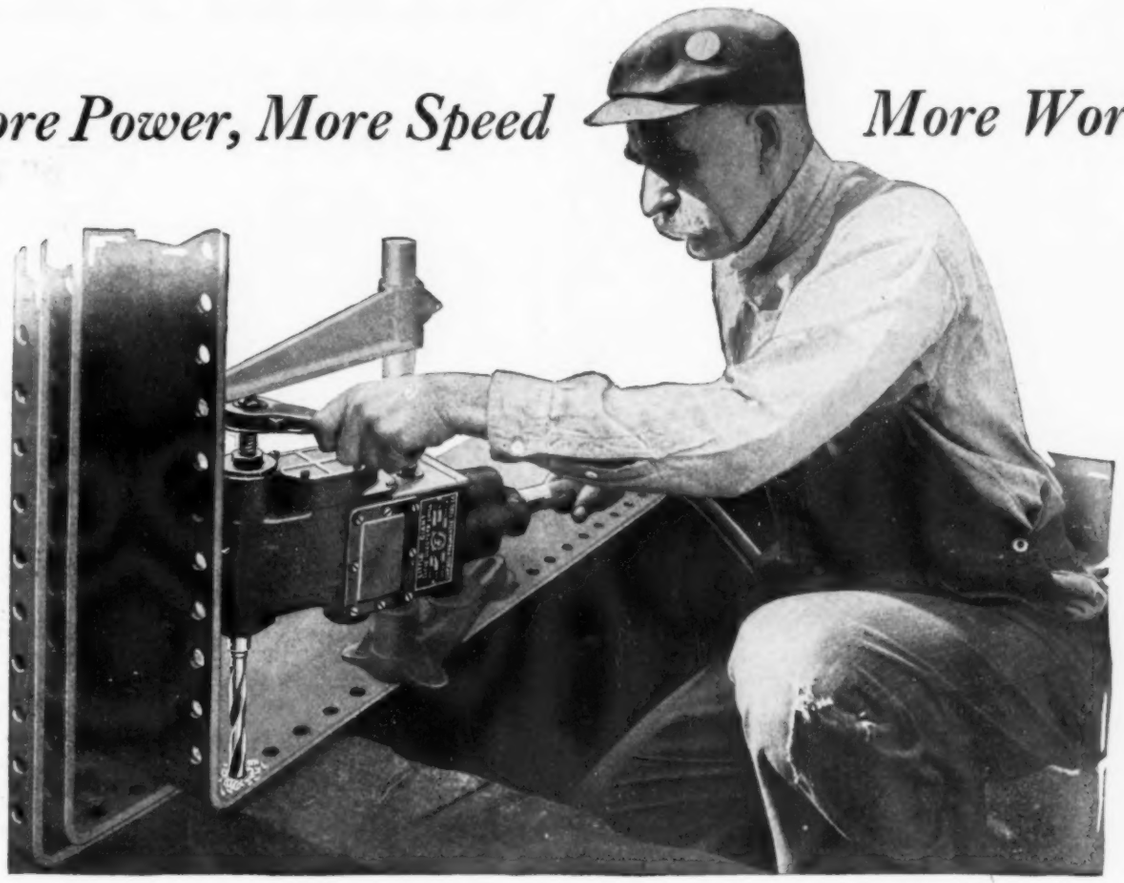
153-PT

APPLY TO NEAREST OFFICE

Little David AIR TOOLS

More Power, More Speed More Work!



ELIMINATING the inefficiency of lost motion, conserving the air power wasted in ratchet-type drills by the "start and stop" method, Little Giant Close Quarters Drills are the tried and proven "last word" in the evolution of close quarters drilling methods.

Little Giant Close Quarters Drills point the way to faster, more powerful, more economical drilling. Let them *prove* it on your work.

1 Compact stub-tooth gear train transmits full power of air motor to spindle, giving steady uninterrupted spindle rotation.

2 No lost motion, over-travel or slippage, consequently maximum power and 33⅓% higher spindle speed than "ratchet" type of drills.

3 Highest possible air economy; smooth, vibrationless action.

4 Specially heat-treated alloy steel stub-tooth gears.

5 Crosshead and piston construction similar to high grade steam engine practice.

6 More Power! More Speed! More Work!

Little Giant Close Quarters Drills, wherever applied, not only enjoy highest favor for drilling in difficult positions, but have also established themselves as a first class tool for all-around drilling, reaming and tapping operations. Easy to handle and control, powerful and speedy, Little Giant Close Quarters Drills meet the needs of a broad range of drill applications.

Little Giant Close Quarters Air Drills are built in three sizes, weights 30, 45 and 50 pounds. Write for Bulletins.

Chicago Pneumatic Tool Company, 1022 Fisher Building, Chicago

Sales and Service Branches all over the World

BIRMINGHAM BOSTON BUFFALO CINCINNATI CLEVELAND DETROIT ELDORADO EL PASO ERIE JOPLIN LOS ANGELES MILWAUKEE MINNEAPOLIS NEW YORK PHILADELPHIA PITTSBURGH PORTLAND RICHMOND SALT LAKE CITY SAN FRANCISCO SEATTLE ST. LOUIS TUCSON BOMBAY BRUSSELS FRASERBURGH HAVANA HONOLULU JOHANNESBURG CHRISTIANIA LONDON MILAN MONTREAL OSAKA PARIS SEOUL SYDNEY TOKYO TORONTO VANCOUVER WINNIPEG

P-32

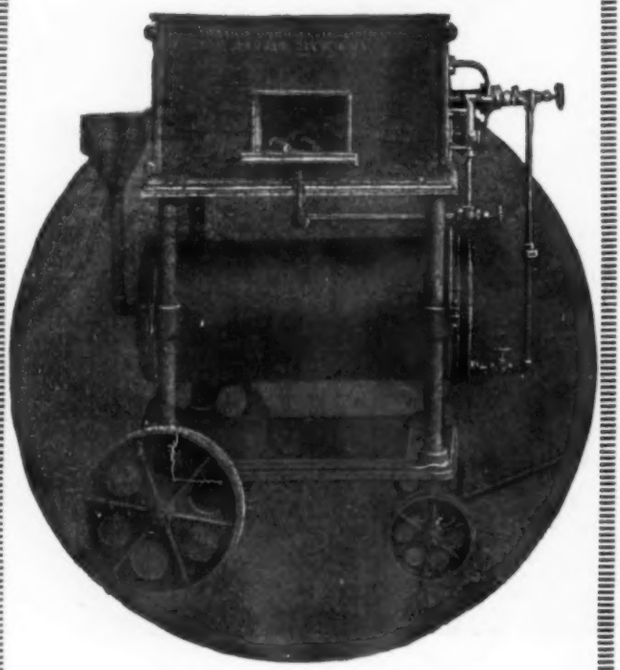
BOYER PNEUMATIC HAMMERS · · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · GIANT FUEL-OIL, GAS, GASOLINE AND STEAM ENGINES ROCK DRILLS · · · COAL DRILLS

LITTLE *Close Quarters* **GIANT** *Air Drills*

BAIRD

Oil Burning Furnace

"Safety First"



"Built for the Job"

IT has been acknowledged since the beginning of oil burners that air pressure carried on top of the oil in the reservoir at a pressure of 75 to 100 pounds is very dangerous, and has resulted in the loss of many lives and much property, for should a nipple or connection break, a stream of oil would be thrown upward and, coming down on the hot furnace, everything in the vicinity would be in flames instantly.

To avoid this danger on one hand and keep within the law on the other it was necessary to find an application by vacuum, dispensing with air pressure on the oil reservoir.

This furnace is a "Safety First" machine in every way. No AIR PRESSURE is carried on the oil reservoir tank, the oil being lifted from the reservoir to the heating chamber by the vacuum process through our specially designed vacuum burner. This furnace operates on the cheapest class of oil fuel possible, the residue of crude, and requires but 10 pounds of air pressure to produce the necessary vacuum. Air pressure is secured from any standard shop air line and reduced to the amount necessary to operate this furnace properly through control valves placed upon the equipment.

The oil reservoir can be filled from an open funnel while the furnace is going full blast.

Size of heating chamber 17 in. x 9 in. x 8 in.

Write our nearest office for equipment to meet your requirements.

BAIRD

Pneumatic Tool Company

General Sales Offices:

Rialto Bldg., Kansas City, Mo.

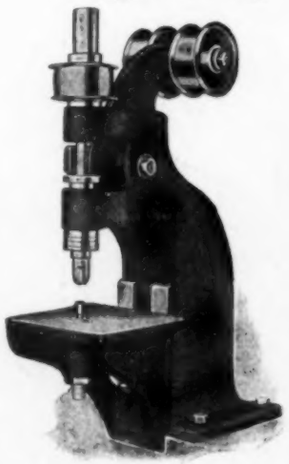
BRANCH OFFICES:

New York, 50 Church St.
Boston, 259 Franklin St.
Pittsburgh, 217 Stanwix St.
Chicago, 32 N. Clinton St.
Philadelphia, 2223 Chestnut St.
Cleveland, Citizens' Bldg.
Detroit, 202 New Telegraph Bldg.
Buffalo, 881 Ellicott Square.
St. Paul, 600 Pioneer Bldg.
St. Louis, 1956 N. Broadway.
Atlanta, Broad and Hunter Sts.
Washington, 509 Munsey Bldg.
Richmond, 203 Mutual Bldg.
Los Angeles, 241 S. Los Angeles St.
San Francisco, 71 First St.
Portland, 46 Front St.
Seattle, L. C. Smith Bldg.

Canada:
Montreal, 327 St. James St.; Toronto, 131-45 Front St., W.

Foreign Sales Offices:
New York, 50 Church Street.

A Rapid, Noiseless Rivet Spinning Machine



The

GRANT

So silent in operation is the Grant that a baby could sleep beside it; so rapid that its capacity is limited only by the ability of the operator to feed it. It spins rivets in the most difficult places with utmost ease and rapidity. Every setting is perfect, too; no marred heads or frames.

Let us show you what the Grant will do for you. Write us today.

Grant Mfg. & Machine Company

85 Stillman Avenue, Bridgeport, Conn.

CLEVELAND AIR DRILLS

Ball Bearing Type

DRILLING, REAMING, TAPPING, AND FLUE ROLLING

MADE IN
61 Styles and Sizes
Reversible and Non-Reversible
Few Parts Used in Construction
Low Cost of Maintenance in Service

We Make { CHIPPING AND RIVETING HAMMERS, SAND RAMMERS, COMPOUND DRILLS, CORNER DRILLS & EMERY GRINDERS.

Bowes' Air Hose Couplings

Standard Equipment Everywhere

AIR TIGHT

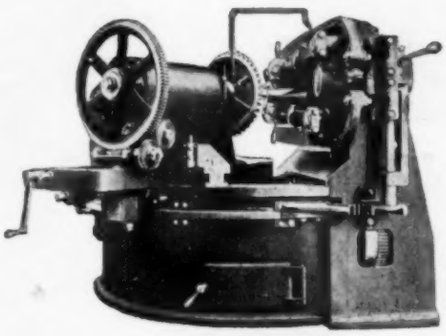
Above cut shows application of Cleco Never-Slip Hose Clamp to Bowes' Couplings. We guarantee that no "Blow-offs" can occur if Cleco Never-Slip Clamps are used.

WRITE FOR BULLETINS NOS. 34a, 41 and 43

The Cleveland Pneumatic Tool Co.

New York Chicago CLEVELAND, OHIO Philadelphia Detroit Pittsburgh St. Louis San Francisco, Calif.
Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ont.
John MacDonald & Co., Pollokshaw, Glasgow, Scotland

The BROWNING
Automatic Bevel Gear Shaper



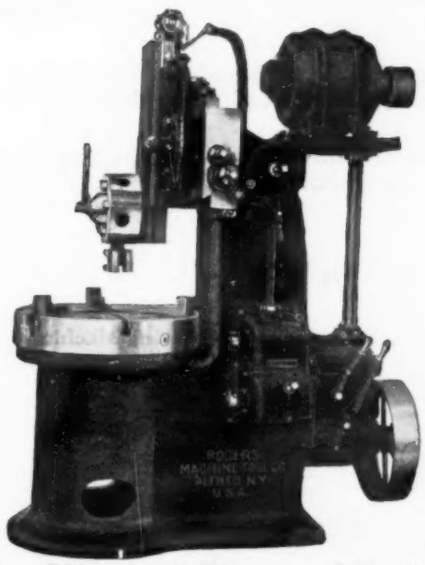
Two tools operating alternately on opposite sides of a tooth finish the gear blank in a single revolution. No extra power is consumed by this operation. Templates guide the tools, correctly shaping the teeth. All index gearing boxed in the index head.

Cuts all gears up to 24 in. diameter, 2 pitch and any pitch angle from 9° to 81°.

Correct your gear cutting faults—
look into the merits of the Browning

The Machine Products Company
East 179th St. and St. Clair Ave., Cleveland, Ohio

Powerful Accurate Efficient

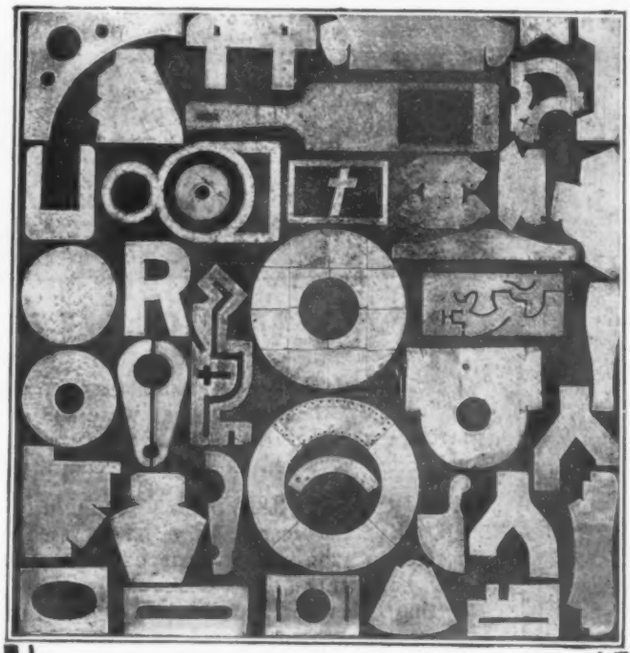


34-in. Vertical Turret Machine

Fitted with either
Plain Table, 3-Jaw Combination or 4-Jaw
Independent Chuck

Motor or Countershaft Drive

Rogers Machine Tool Co., Inc.
Alfred, N. Y.



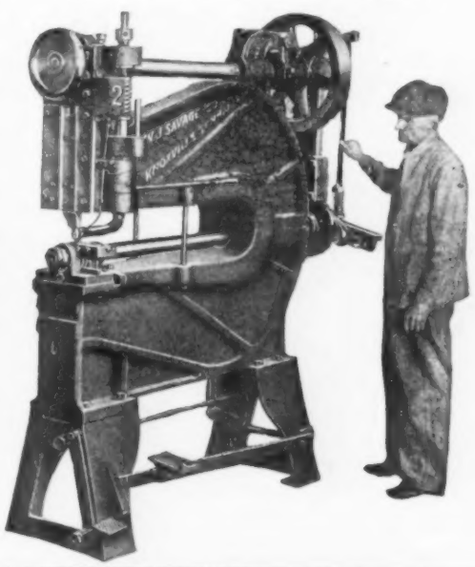
Like feeding cloth to a sewing machine

this Gray's Sheet Metal Cutter automatically feeds the sheet metal through the cutters while the operator simply guides it. This feature saves a great deal of time and labor and make this machine most economical for the production of sheet metal parts of any description. Gray's sheet metal cutters are made in four sizes for cutting $\frac{1}{8}$, $\frac{3}{16}$, $\frac{3}{8}$ and $\frac{5}{8}$ inch plates. They cut within an exceptionally small radius.

Ask us to send complete details.

W. J. Savage Company, Inc.
Knoxville, Tenn.

European Agents:
Alfred Herbert, Ltd., Coventry, England



THURSTON SAWS
"VULCAN QUALITY"

WHO WAS VULCAN?

Vulcan was something more than a mythical deity of ancient metal workers—he was an ideal, a goal of attainment. His handiwork represented the dreams of perfection indulged in by the metal artisans of the day.

THURSTON SAWS may be termed of VULCAN QUALITY because they have reached the stage of perfection which in ancient days was attributed only to the handiwork of VULCAN. They give maximum cutting service because they are properly formed, tempered and annealed by the THURSTON PROCESS.

Literature and prices on request

Thurston Manufacturing Co.
Providence, R. I., U. S. A.

ACTUAL SAVINGS

have paid for one of our **Automatic Wire Straightening and Cutting Machines** in less than three months.

They take the wire from the coil, straighten it perfectly and cut it to accurate lengths.

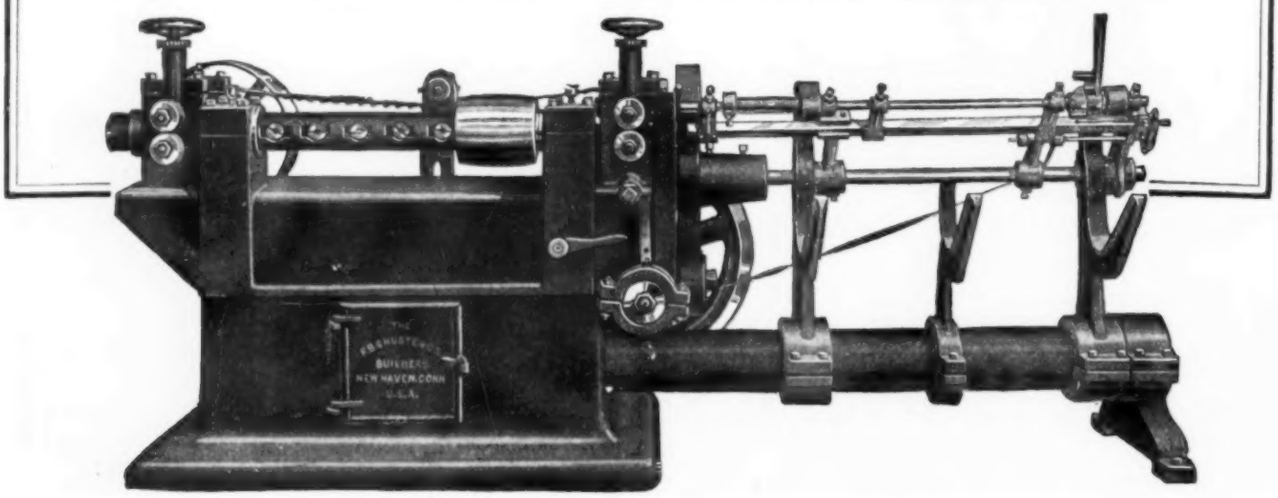
Made in many sizes and handle all kinds of wire, brass, copper, steel, iron, aluminum, gold, etc.

If you use wire cut to lengths you cannot afford to be without one.

May we send you catalogue 12?

THE F. B. SHUSTER CO., New Haven, Conn., U. S. A.
Formerly John Adt & Son. Established 1866

Also makers of Straighteners and Cutters for hexagons, squares, flats, etc., and Riveting Machines



Bilton Riveting Machines

High Production on Padlocks

Photograph shows battery of 10 Bilton Riveting Machines riveting padlocks in plant of O. M. Edwards, Syracuse, N. Y. The revolving blow action of the Bilton has proved to be the quickest and most economical method for their particular kind of work. Photo shows that even girls and young boys can operate these machines profitably.

The revolving blow action insures a tight rivet, a full hole and a good finished head.

Send for Catalog 10-G

The Bilton Machine Tool Co.

Housatonic Ave.

Bridgeport, Conn.

FOREIGN AGENTS: Alfred Herbert, Ltd. M. Mett Engineering Co. Charles Churchill & Co., Ltd.

Tools—and What Depends on Them

THE tools that you use in your plant are the factors upon which depend the quality of your product.

Tools that stand up; tools that cost no more, yet last longer hold the size, do their work properly—these are the kind that every manufacturer who is running his plant on a competitive basis will appreciate.

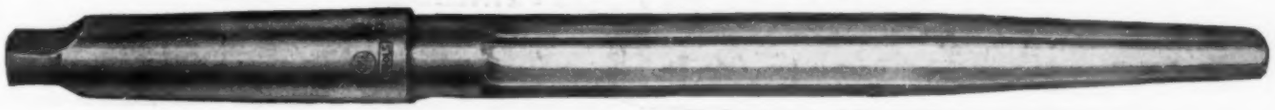
Ampco Tools are good tools. Our three-lip drills and bridge reamers are used in many prominent plants and shipyards throughout the country, where they are rapidly building themselves a reputation for long-run economy.

Send for our catalog on Standard Milling cutters, reamers and three Flute Drills. We carry a complete stock of Standard sizes.

AMPCO TOOLS

AMERICAN MACHINE PRODUCTS CO.

Detroit, Michigan



Elmes—Chicago

HYDRAULICS

If you have a hydraulic problem put it in capable hands. Elmes has furnished hydraulic equipment for some of the biggest plants in the country and can give you expert service.

Anything in Hydraulics.

Straightening Presses, Forging Presses Hydraulic Presses, Forcing Presses, Accumulators, Die Work Presses, High-Pressure Fittings, etc.

Write for our catalog which describes our complete line.

Charles F. Elmes Engineering Works

1001-1003 Fulton St., Chicago, Ill., Est. 1861

Horizontal Multi-Blow Riveting

This machine is a wonderfully fast, convenient riveter for long or bulky work. Strikes 80 to 1000 blows per second. Circular? Other types or styles.

H. P. Townsend Mfg. Co.

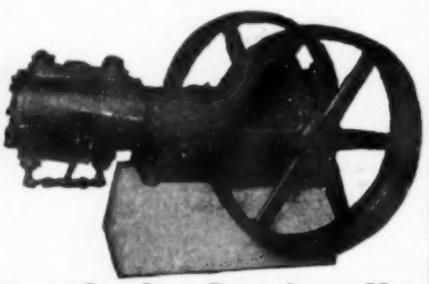
Hartford, Conn.

Standard Air Compressors

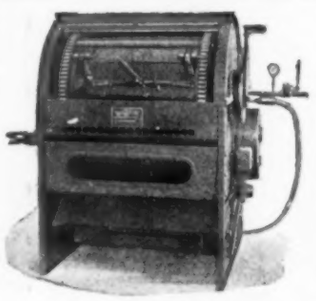
possess all the desirable features required of a machine of this class. Pleasing in design, simple, durable and reliable in operation.

Freedom from ordinary compressor troubles and ease of adjustment should occasion require. The best of materials and workmanship enter into the construction of these single stage, straight line, center crank, belt-driven air compressors.

Send us your name that we may forward details.



Stratton & Bragg Co., Inc., Petersburg, Va.



"GB" Barrel Sand-Blast

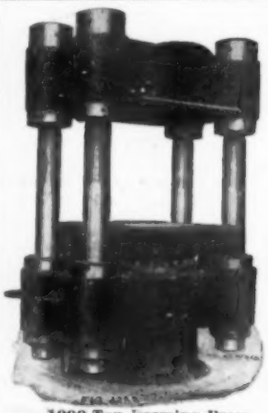
"Pangborn" Sand-Blasts

Quickly, thoroughly and cheaply clean

CASTINGS, FORGINGS, STAMPINGS, HEAT TREATED PARTS, SHEET PLATE OR STRUCTURAL.

A type and size for every requirement. See full page ad. last issue, page 297.

PANGBORN CORPORATION HAGERSTOWN, MD. SAND-BLAST SPECIALISTS *Let's Go*



1000-Ton Forming Press

Let Us Build Your Hydraulic Machinery

Because:

1. Adequate manufacturing facilities especially adapted to the economical building of high-grade hydraulic equipment.
2. Intelligent interpretation of your needs and advisory service based on intimate familiarity with advanced pressure practice.
3. Short time delivery.

The Hydraulic Press Mfg. Co.

Engineer-Builders of Hydraulic Machinery exclusively

Mount Gilead, Ohio

New York City, Detroit, Pittsburgh, Suffern, N. Y., Cleveland, San Francisco.

ELLISON Drill Chucks

When you tighten a drill in an Ellison Drill Chuck there is no need to worry about the drill slipping under high speeds with the consequent burring up and marring of the shanks.

Slipping eliminated means no power loss and no spoiled drills.

Write for details today.

The American Machine Co.

104 Wellington Ave., Hartford, Ct.

INDESTRUCTIBLE D&W MAGNETIC CHUCKS REG. U.S. PAT. OFF.

Magnetic Chucks

For grinding, planing, shaping, and milling.

Made in flat, rotary, taper, and swiveling styles.

D & W FUSE COMPANY

Providence, R. I., U. S. A.

HYDRAULIC TOOLS

Broaching presses, Benders, Pumps, Accumulators, Die presses, Punches, Shears, Shaft straighteners, Bolt forcers, Hydraulic fittings, etc. Write for catalogs. **We build to order to meet special requirements.**

WATSON-STILLMAN COMPANY

42 Church St., New York

Chicago: McCormick Bldg

W-S HYDRAULIC

It's Substantially Built— This Sand Blast Machine

The Paxson-Warren Sand Blast Machine is the most efficient made. Every part is accessible. Repairs are few and all wearable pieces easily replaced. Better cleaning—cheaper cleaning of castings. Circular on request.

J. W. Paxson Company, 1021 N. Delaware Ave., Phila., Pa.

Manufacturers' Foundry Equipment and Supplies

BETTER HOEVEL SAND-BLAST AUTOMATIC MACHINES Patented

Dustless Sandblast Rooms, Rotary Table, Revolving Barrel, Sandblast Machines, Hose Sandblast and all other Sandblast Equipment.

HOEVEL MANUFACTURING CORPORATION

158 Ogden Ave., Jersey City, N. J.

Controlled by L. O. Koven & Brother

Cleveland Office: 503 American Trust Bldg.

Working With the TURRET MILLHOLLAND LATHES

Millholland Turret Screw Machine

THE operator who knows his business enjoys putting the Millholland Turret Screw Machine through its paces. Producing a certain quantity ceases there to be work and becomes artisanship.

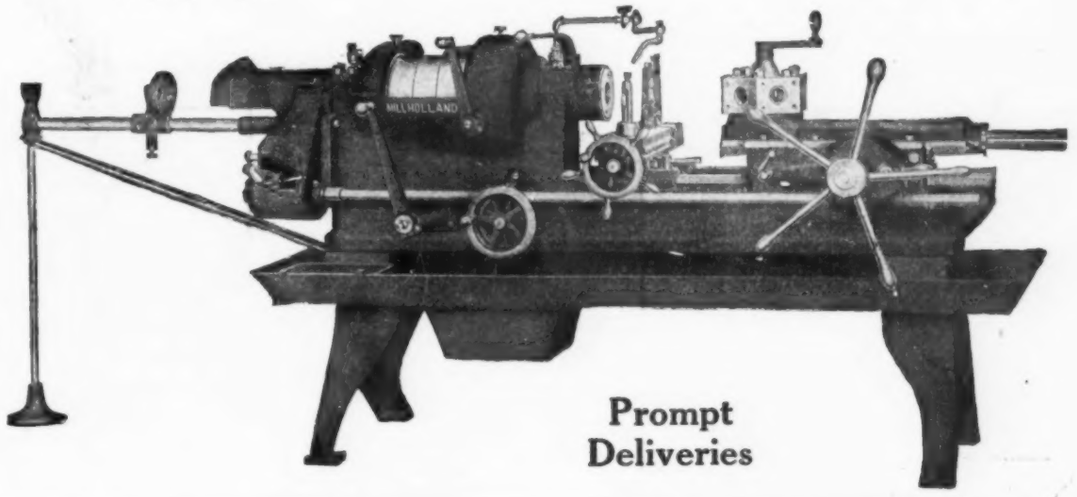
He gets quality, too. The Millholland does exactly what training has taught him that a good machine should do.

Providing full scope for the ability of a workman, and giving him reason for liking his daily task, are two very important factors in shop management.

The Millholland meets the high-class man half way. That's why we say he works "with" it—not "at" it.

You have a force of good men. Why not give them the best to work with?

A post card is all that is needed to get full details to you by return mail.



Prompt Deliveries

Millholland Machine Company

Indianapolis, Indiana

Agents in all principal buying centers

New York Office: 111 Broadway, Room 622

MON
LAT

ARCH

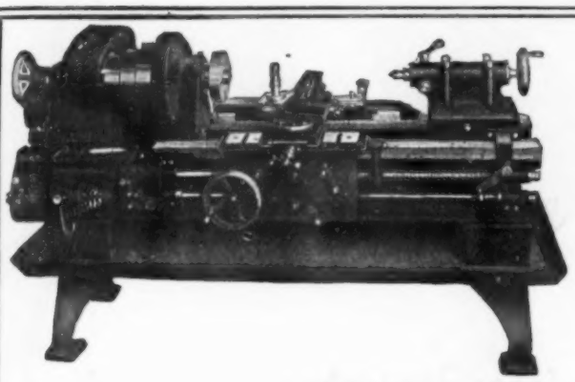
In the great automobile factories, where every effort is strained to make deliveries meet ever-increasing demand, Monarch Lathes are turning out a large production of the most minute accuracy.

At the great small tool factories, where every finished item must be machined to the closest limits, Monarch Lathes are delivering maximum production and rendering long-time service.

Wherever lathes are used, Monarch Lathes are consistently backing up the guarantee of the maker—"Satisfaction To The User."

And, bearing this same guarantee, there are more Monarch Lathes built and sold each year than are produced by any other manufacturers of high grade lathes.

The Monarch Machine Tool Company
Sidney, Ohio



The *Policy* of "Lehmann Lathes"

THE years that we have spent in developing the "Lehmann Lathe" to its present standard have not been in vain. We have made our lathe to meet the demands of modern industry—to fit the need for a practical, rigid, moderately-priced machine, which is capable of doing all that it is called upon to do, in the most expeditious manner.

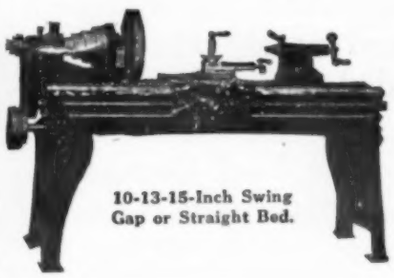
"Lehmann Lathes" are not sold for "what we think we can get for them." Their price is based on their actual worth to the user.

Their increasing demand—their expanding popularity among prominent machinists have given evidence that "Lehmann Lathes" are doing all that we expected.

With hopes for your continued prosperity, together with the compliments of the season.

LEHMANN MACHINE COMPANY
BROADWAY AND POPULAR, SAINT LOUIS, MISSOURI

SEBASTIAN LATHES



10-13-15-Inch Swing Gap or Straight Bed.

Medium Priced Good Lathes for 30 years

Write for Catalog

The Sebastian Lathe Co.
117 Culvert St., Cincinnati, Ohio, U. S. A.

Libby Turret Lathe

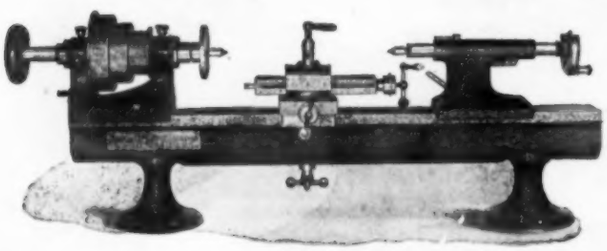
A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. **Let us give you full details.**

International Machine Tool Co. **Indianapolis, Ind.**

CINCINNATI LATHES

have thoroughly demonstrated in shops everywhere what we claim. You take no chances now or years hence when you buy them. Our **Quick Change Feed Box** gives an unlimited range to cut odd or metric threads if desired, besides the standard changes made at once. *Let us figure on your requirements*

THE CINCINNATI LATHE & TOOL CO.
OAKLEY, CINCINNATI, OHIO, U.S.A.



Henry Prentiss & Co., New York, Boston, Rochester, Syracuse, Buffalo, Scranton; W. E. Shipley Mchry. Co., Philadelphia; National Supply Co., Toledo, Ohio; Chas. A. Strelinger & Co., Detroit; Machineshop Equipment Corporation, Boston; Louis G. Henes, San Francisco. Foreign: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester Glasgow; Stokvis & Zonen, Inc., Rotterdam.

Bench Lathe With Slide Rest

A precision machine which, with various standard attachments, is capable of doing accurate turning, boring, drilling, grinding, thread cutting, etc., at production speeds. Prominent manufacturers of electrical apparatus, phonographs, small arms, watches, tools, etc., find these machines profitable—how about you?

Shall we send our Catalogue?

THE WADE-AMERICAN TOOL CO.
309-311 Atlantic Ave., Boston, Mass., U. S. A.
Successors to W. H. Wade of Boston, American Watch Tool Co. of Waltham.

Lapointe Broaching Machines

RIGID POWERFUL FAST

SIZE: No. 1, for cutting keyways $\frac{3}{8}$ in. x $\frac{3}{16}$ in. or light broaching such as $\frac{3}{4}$ in. square holes from round.

No. 2, For $\frac{3}{4}$ in. x $\frac{3}{8}$ in. x 12 in. keyways in steel, or $1\frac{1}{4}$ in. square from round holes.

No. 3, cuts keyways up to $1\frac{1}{2}$ in. wide or broaches square holes up to 3 in. across flats from round holes drilled in steel. No. 4, cuts keyways up to 4 in. wide, and broaches square holes up to 4 in. across flats, from round holes drilled in steel.

FOR INTERNAL GEARS, SPIRALLY GROOVED BUSHINGS, ROUND HOLES, DOVETAIL GROOVES AND ALL USUAL BROACHING JOBS

GOOD DELIVERIES FROM FACTORY AT HUDSON, MASS.

A Machine for Every Standard Metal Working Operation

Henry Prentiss & Company

INCORPORATED

Boston
Buffalo

149 Broadway, New York
WAREHOUSE: JERSEY CITY

Rochester
Syracuse

STARK STANDARDS

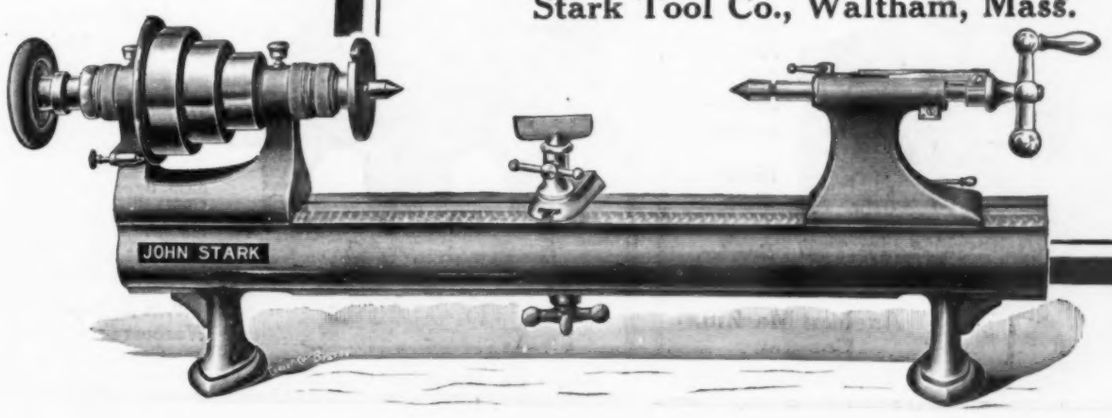
THE fine quality and honest merit of Stark Precision Bench Lathes have been a matter of just pride with this company for more than fifty years. John Stark, father and son, had faithfully in mind for half a century that no design or experiment were too costly, no care too great, no process of manufacture was too expensive, to produce and develop these wonderful tools.

Stark Tools are produced today upon the same high plane, by the same organization which has always built them—an organization which has been carefully trained to Stark Standards.

That is why Stark Tools satisfy the most exacting craftsman. That is why they "stand up" under overload, and production manufacturing.

If you do not know their peculiar merits, ask any user. Anyway, send for our catalogue

Stark Tool Co., Waltham, Mass.



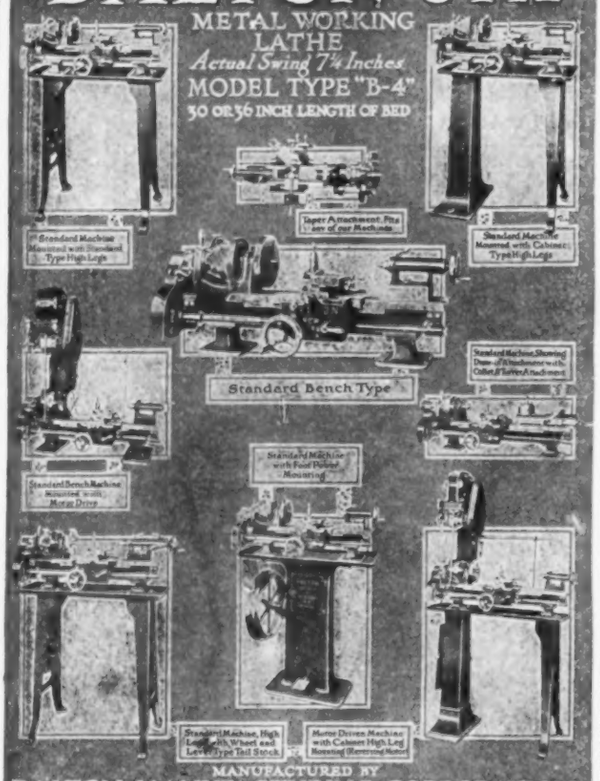
"DALTON SIX"

METAL WORKING LATHE

Actual Swing 7¼ Inches

MODEL TYPE "B-4"

30 OR 36 INCH LENGTH OF BED



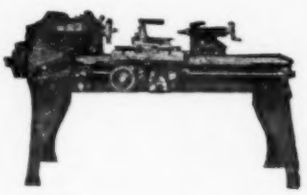
MANUFACTURED BY

DALTON MANUFACTURING CORPORATION

NEW YORK U.S.A. CABLE ADDRESS "ALEDAL" NEW YORK

QUICK CHANGES

Thirty-two changes of feed and thread; twelve spindle speeds with 3-step cone, 2½-in. belt. This 14-in. Quick Change Gear Lathe has a swing of 15¼ inches. Sleeve gears are of steel, running on hardened studs. All gears inclosed.



Write for Bulletin E

The Carroll-Jamieson Machine Tool Co.

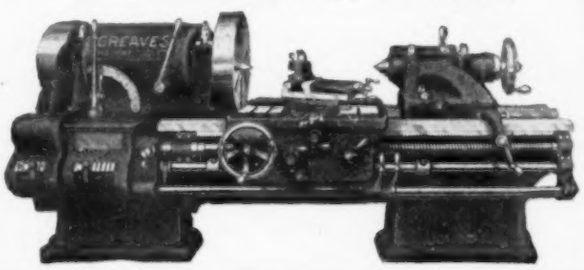
Davis Avenue, Batavia, Ohio

Geo. H. Alexander, Birmingham, England

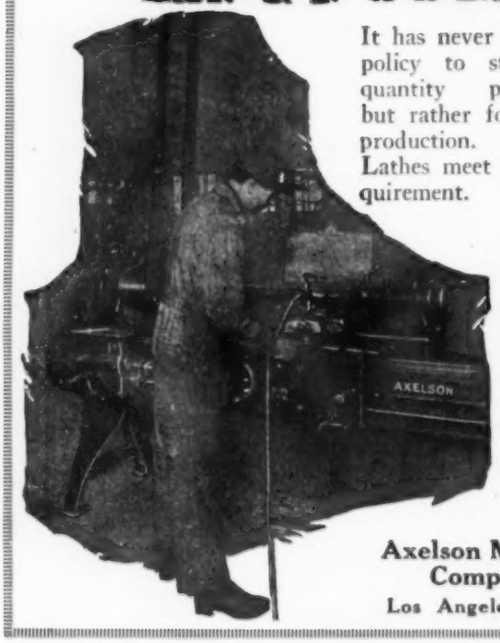
Investigate the Possibilities of this 24-in. Geared Head Engine Lathe

It has many advantageous features peculiar to it that make it the ideal Single Pulley Drive for either heavy or light work at a rapid speed. *Write for complete descriptive bulletin.*

Greaves Machine Tool Co., Cincinnati, Ohio



16-in. 18-in. 24-in. **AXELSON · HEAVY DUTY · LATHES**



It has never been our policy to strive for quantity production but rather for quality production. Axelson Lathes meet every requirement.

Ask for full Specifications.

Immediate Deliveries.

Axelson Machine Company

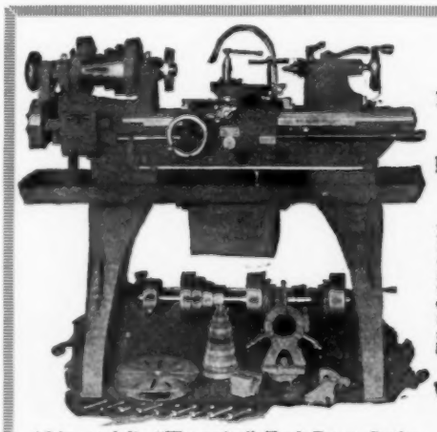
Los Angeles, Calif.

Garage and Machine Shop Work

can be easily handled by the well-constructed and specially designed Union Lathe. Made in various sizes at a moderate price.

THE UNION LATHE WORKS

York, Pa., U. S. A.



12-in. x 4-ft. "Worcester" Tool Room Lathe

Worcester Lathes

12-in. and 14-in.

Cone Drive Geared Head Motor Drive or Single Pulley Drive

Beside usual equipment these lathes include: Oil Pan, Pump and Piping, Taper Attachment, Draw-in Chuck, Turret on Shears, Four Tool Post and Automatic Lateral Feed Stop.

Write for Details

Worcester Lathe Company

Worcester, Mass.

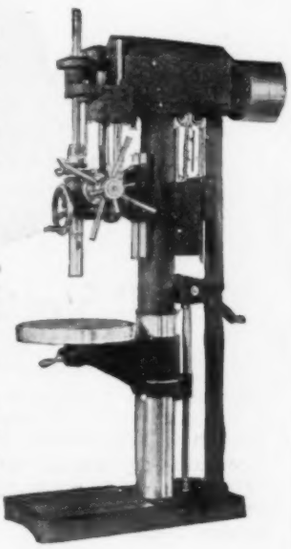
They Help Speed Up Production

This Wisconsin 20-in. All Gear Drill Press will help you increase your day's output considerably.

It is a most rigid, convenient machine with all the good points of the ordinary drill press and many new features not heretofore known.

The gear head single pulley drive which has displaced the usual cone pulley drive, eliminates all necessity of belt shifting.

A single movement of a convenient lever permits the changing of speeds without stopping the machine.



Dauber-Kratsch Company
Oshkosh, Wis., U. S. A.

The WICKES 17-in.

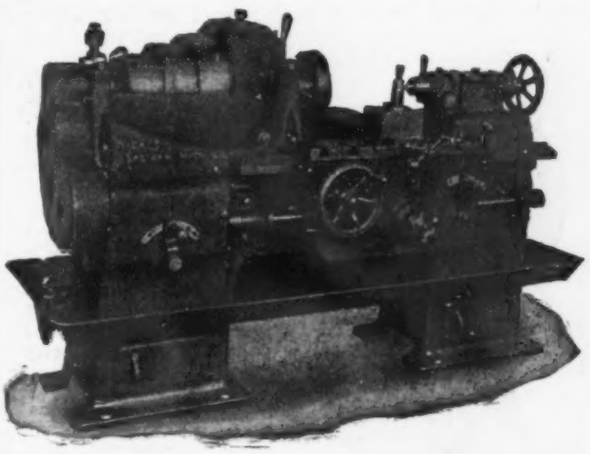
Rapid Production Heavy Duty Lathe

STRENGTH and rigidity, with a pull that is surprising.

ACCURACY, extreme precision and a duration of these conditions.

CONVENIENCE in the operation of a powerful instantaneous friction stop and start.

DURABILITY as to strength of parts remains unquestioned.
Our other lines of various sizes, all heavy duty, will interest the most exacting purchaser.



WICKES BROS., Saginaw, Mich.

Agents: Wickes Bros., Seattle, Washington; Rolph, Mills & Co., San Francisco and Los Angeles, Calif.; Dale Brewster Machinery Co., New York City and Chicago Ill.; Badger-Packard Machinery Co., Milwaukee, Wisconsin; P. H. McArdle, New Orleans, Louisiana; Davies Morand Machinery Co., Detroit, Michigan. McCoy-Brandt Machinery Co., Pittsburgh, Pa.
Foreign Agents: Dale Brewster Machinery Co., France, Belgium and Italy

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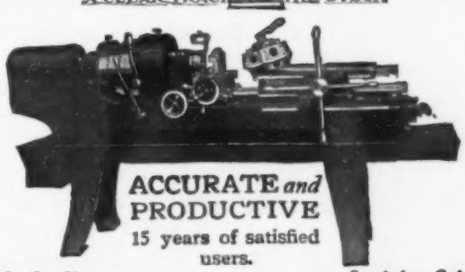
is the nationally recognized center for advertising special opportunities in the machinery field.

THE TILTED TURRET

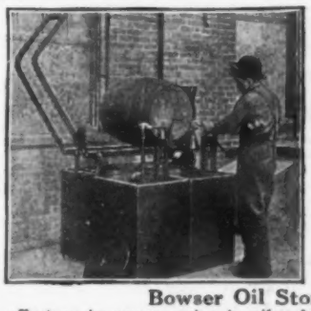
A CLEAR TRACK TO THE STOCK



ACCURATE *and* **PRODUCTIVE**
15 years of satisfied users.

Ask the User *Send for Catalog*

WOOD TURRET MACHINE CO.
BRAZIL, INDIANA, U.S.A.



BOWSER
ESTABLISHED 1885

Oil Storage

Means clean oils, better lubrication, decreased fire risk, increased output and better conditions generally.

Bowser Oil Storage Systems
effect an immense saving in oils, clean up the oil room, give greater satisfaction in the use of all oils. There is a BOWSER outfit suitable for wherever oils are handled.
Descriptive bulletins sent promptly on request.

S. F. Bowser & Co., Inc. Fort Wayne, Indiana U. S. A.
Sales offices in all centers and representatives everywhere.

The ETNA No. 2 Swaging Machine Will Release Your Big Machines

It will handle any number of jobs now being done on larger machines. This means a saving of power, of time and money, as the Etna is speedy as well as accurate.

It is adapted for a general line of small swaging work, but is a strong, rugged machine that will stand up under constant use.

It is equipped with rear bearing to relieve strain on bearings and give more rigidity to the entire machine. This is a very valuable feature found on no other machine. Dies for the No. 2 do not cost as much as on most machines—this is another saving. Capacity ¼ in.

Swaging machines up to 4½-in. capacity.

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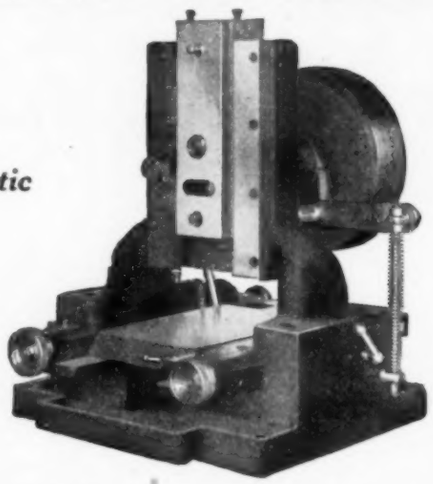
The Etna Machine Co.

Toledo, Ohio

High Speed Automatic



"Penn" Slotting Machines for Small Keyway Jobs

Designed for slotting keyways in small work—as commonly found in the manufacture of Motor Cycles, Firearms, Typewriters, Sewing Machines, etc.

Accurate—convenient—rapid.

Will keyway ⅜-in. x 1-in. in cast iron; ⅛-in. x 1¾-in. in cast iron; ⅛-in. x 1-in. in steel. Maximum length of stroke, 2 in.

Get full particulars in Circular

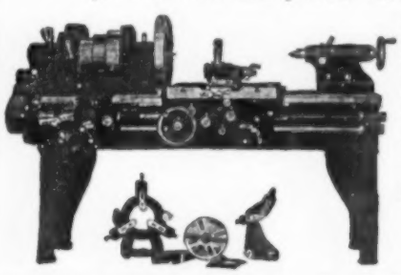
SWIND MACHINERY CO.

Widener Bldg., Philadelphia, Pa.

"Economy Lathes"

True to the Name

Economical in first cost; Economical to operate; Ideal for tool room and general manufacturing.



Made in 14 in. and 18 in. double back geared and semi and quick change.

Ask for the details

Rockford Lathe and Drill Company

Rockford, Ill. U. S. A.

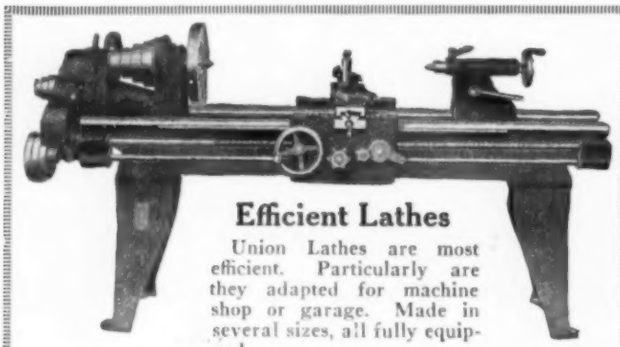
"SPEED UP" WITH A SHEPARD 12 in. LATHE

A reversing lever in the headstock enables the operator to obtain the various feeds instantly without stopping the lathe to shift belts, etc. Gears in the headstock are all steel.

May we send details?

Shepard Lathe Co.

Cincinnati, O.



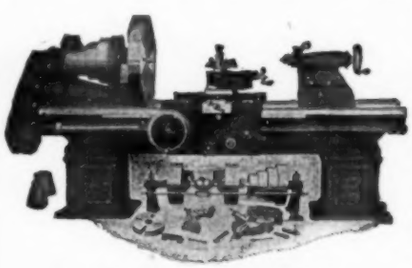
Efficient Lathes

Union Lathes are most efficient. Particularly are they adapted for machine shop or garage. Made in several sizes, all fully equipped.

Write for details

The Union Lathe Works, York, Pa., U. S. A.

SOUTH BEND LATHES



Made in six sizes, 13-in., 15-in., 16-in., 18-in., 21-in. and 24-in. swing, with beds from 4 ft. to 16 ft. in length. Straight or gap bed.

Have been on the market 14 years; over 22,000 in use

Send for New Catalog No. 57

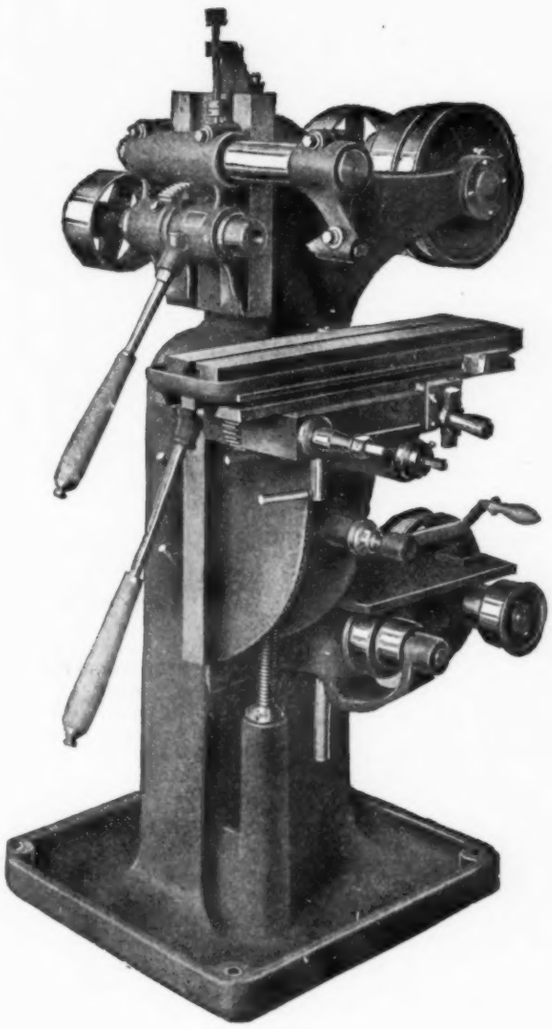
South Bend Lathe Works, South Bend, Ind.

422 E. Madison Street

A Hand Feed Milling Machine

with

Power Feed Attachment



BRISTOOL

THE convenience and economy of this Bristol Hand Miller can only be known by actual use. It is a miller designed for the rapid milling of small parts on which the operation is confined to a table feed. On parts that must be absolutely accurate and of a high quality finish, the power feed attachment is most desirable and it positively eliminates all chatter. It will handle more quickly and better much of the work you are now doing on larger machine.

Write for our bulletin 10 PM. It contains many milling facts worth considering.

Bristol Machine Tool Company

Successors to C. G. Garrigus Machine Company

Bristol, Conn., U. S. A.

The Modern Drilling and Tapping Machines

Feeds all obtained with one handle.

Oil baths to the parts subject to wear.

Safety laws fully complied with.

Dustproof enclosures for gearing.

Increased capacity with minimum power.

Case hardened heavy driving and bevel gears.

Knock out and automatic trip to feed without disengaging feed worm.

Unsurpassed workmanship and finish.

Phosphor bronze bushings (no babbitt).

Range of speeds for small, medium or large work.

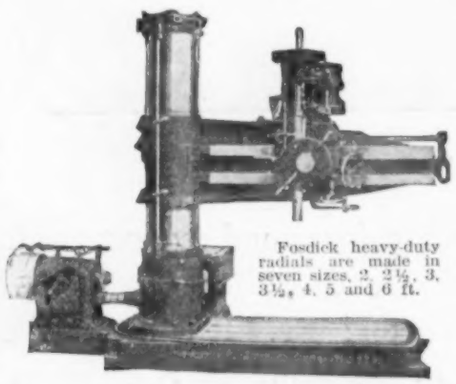
Interchangeable parts.

Ground column, spindle and shafting.

High speed and heavy duty combined.

Tapping attachment in the proper location.

Sliding head raised or lowered by handwheel.



Fosdick heavy-duty radials are made in seven sizes, 2, 2½, 3, 3½, 4, 5 and 6 ft.

Fosdick Heavy Duty Radial

For general all-around adaptability. Built to satisfy the most skeptical, this machine will reduce operating expense greatly and help boost output.

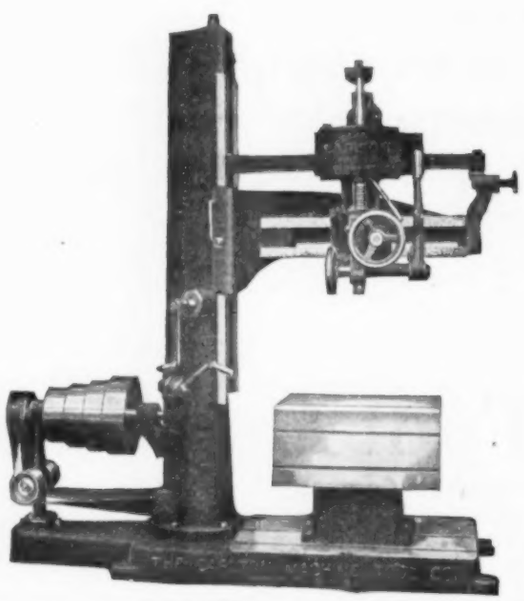
Get the Catalogue and note its many features

THE FOSDICK MACHINE TOOL CO.

Cincinnati, Ohio, U. S. A.

AGENTS: Biggs-Watterson Co., Cleveland, Ohio. Colcord-Wright Machinery & Supply Co., St. Louis, Mo. Eccles & Smith Co., San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore. Fairbanks Co., New York, N. Y.; Hartford, Conn.; Albany, N. Y. E. A. Kinsey Co., Cincinnati, Ohio; Indianapolis, Ind. Peninsular Machinery Co., Detroit, Mich. Homer Strong, Rochester, N. Y.; Buffalo, N. Y. H. A. Smith Machinery Co., Syracuse, N. Y. Swind Machinery Co., Philadelphia, Pa. Somers, Fitler & Todd Co., Pittsburgh, Pa. Stocker-Rumely-Wachs Co., Chicago, Ill.; Milwaukee, Wis. Taylor Machinery Co., Boston, Mass. A. R. Williams Machinery Co., Ltd., Toronto, Ont., Canada. Burton Griffiths & Co., London, England. Fenwick Freres & Co., Paris, France. Wynmalen & Hausmann, Rotterdam, Holland. Rylander & Asplund, Stockholm, Sweden, Copenhagen, Denmark. Roku Roku Shoten, Tokyo, Japan. R. L. Scrutton & Co., Sydney, Australia.

All the Features You Desire are Embodied in CARLTON SPEEDY SENSITIVE RADIALS



THEY are all belt driven, only four gears in their entire construction and they are hand operated.

Eight spindle speeds ranging from 300 to 1,170 r.p.m. can be obtained, thus providing a correct speed for driving your high speed twist drills at their maximum working efficiency and increasing output.

All operating levers are conveniently located to the operator.

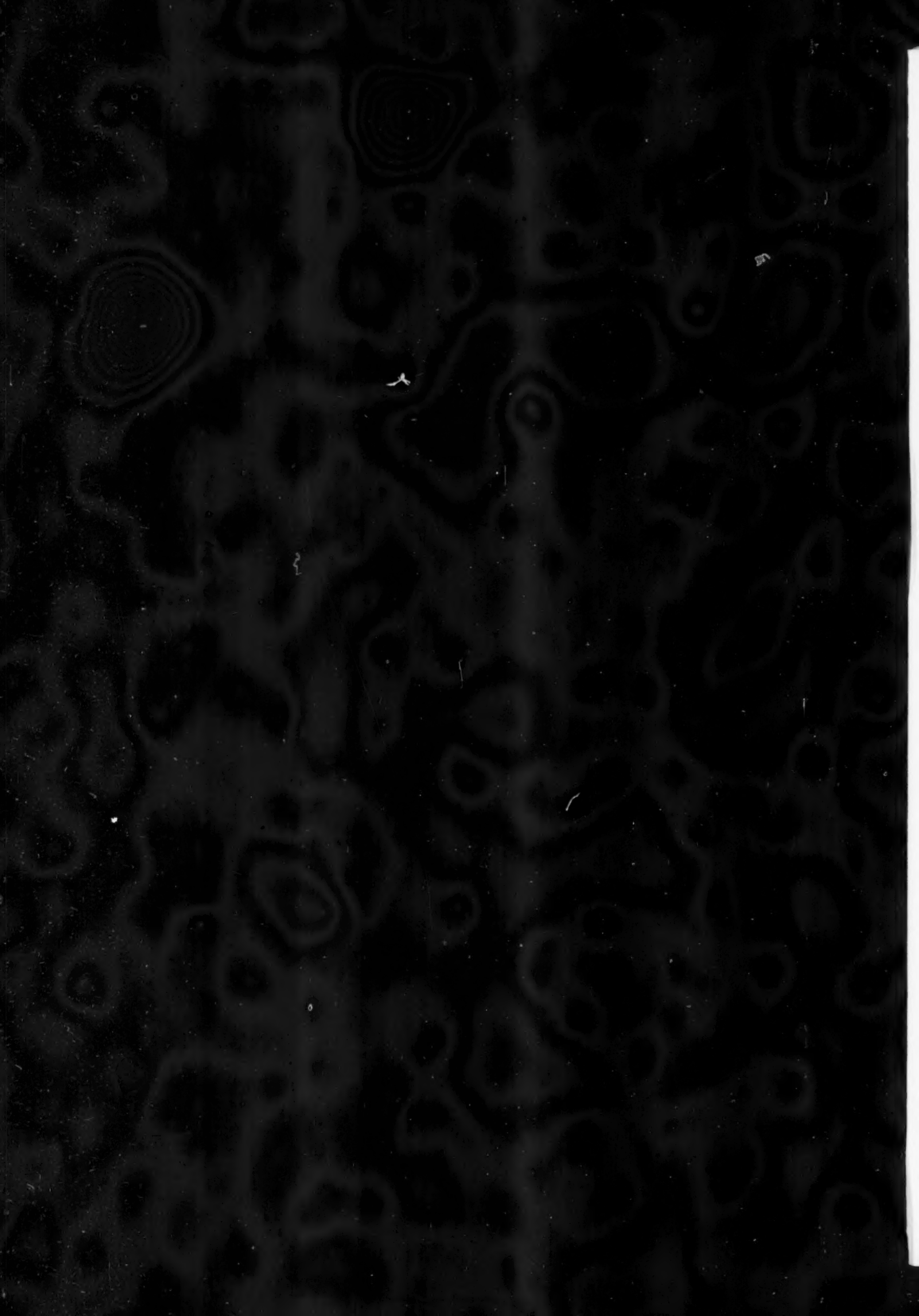
These features and many others make Carlton Speedy Sensitive Radial Drilling Machines worthy your investigating.

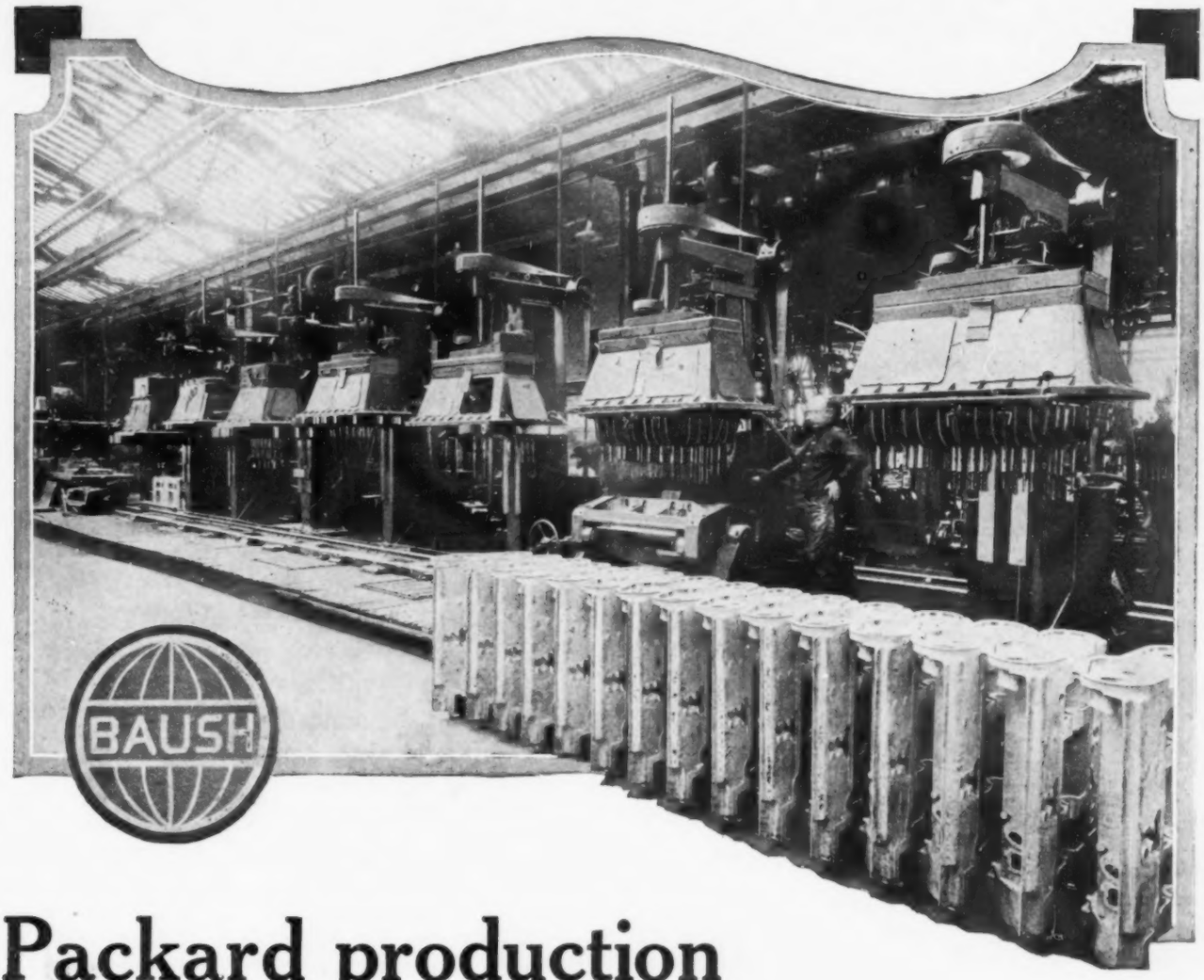
They are made in 2½, 3, 3½ and 4 ft. sizes.

Our circular sent promptly on request. Write us today.

The Carlton Machine Tool Co.

Cincinnati, Ohio





Packard production from BAUSH efficiency

AS AN example of modern quantity and quality production the Packard Motor Car is without question among the foremost. For production such as this high class machinery of correct design is necessary.

The illustration shows how a battery of BAUSH MULTIPLE SPINDLE DRILLS operating in the Detroit Factory of the Packard Motor Car Company helps to make their superlative production possible. The efficiency of the Baush for drilling is unsurpassed.

Become a Modern Producer. Investigate Baush Efficiency. Write today for a catalog.

Baush Machine Tool Company

Springfield, Mass.

Detroit Office: 1825 Dime Savings Bank Building

Represented by Manning, Maxwell & Moore, Motch & Merryweather, Alfred Herbert, Coventry, Eng., Fenwick Freres, Paris, France

Something NEW in Bore Grinder Design

Many new ideas are included in the design of this original Bore Grinder.

To begin with the machine is entirely self-contained.

The drive can be either from the line shaft or through a jack shaft.

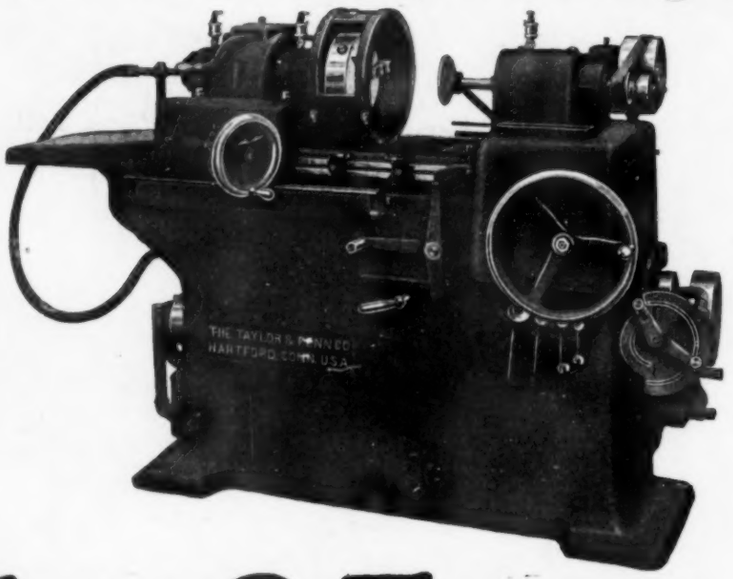
The wheel spindle and spindle drive have a solid stationary support which is practically part of the base proper.

Cross feed and longitudinal movement are on V and flat ways underneath the work head.

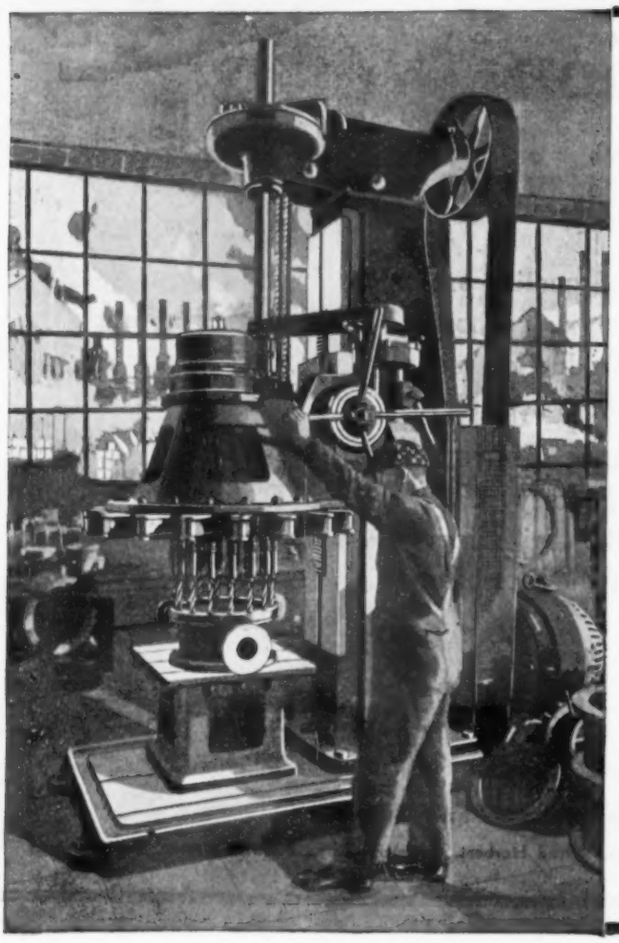
Table reverse is noiseless and no shock is felt when reverse takes place.

Vibration in all parts is eliminated and speed with the greatest possible accuracy in grinding is assured.

There are many other new features. All are described in our circular. Write for one today.



The Taylor & Fenn Company
Hartford Conn. U.S.A



"We Find They

Pay Us Big—Even Tho We Haven't Enough Work to Keep Them Busy All the Time"

"HARRINGTON"
MULTIPLE SPINDLE DRILLS

are a big dividend-paying investment because they drill so many holes at once. When the operator is "out of holes," he can fill in on some other job.

That's what one of our customers says. Did *you* ever think of it from this angle before?

Why not let us send you full particulars—Write today.

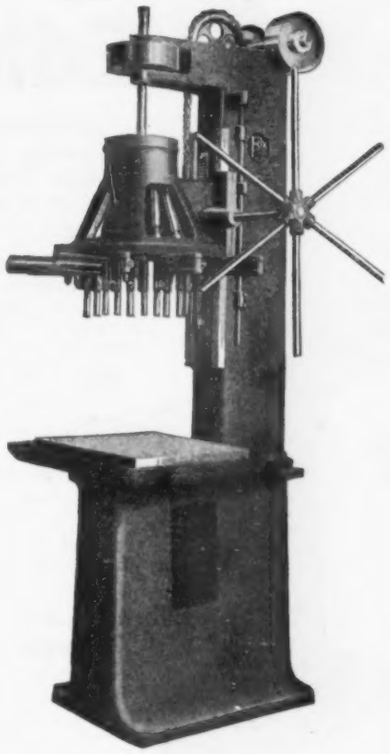
EDWIN HARRINGTON SON & CO.
PHILADELPHIA, PA.

FOX

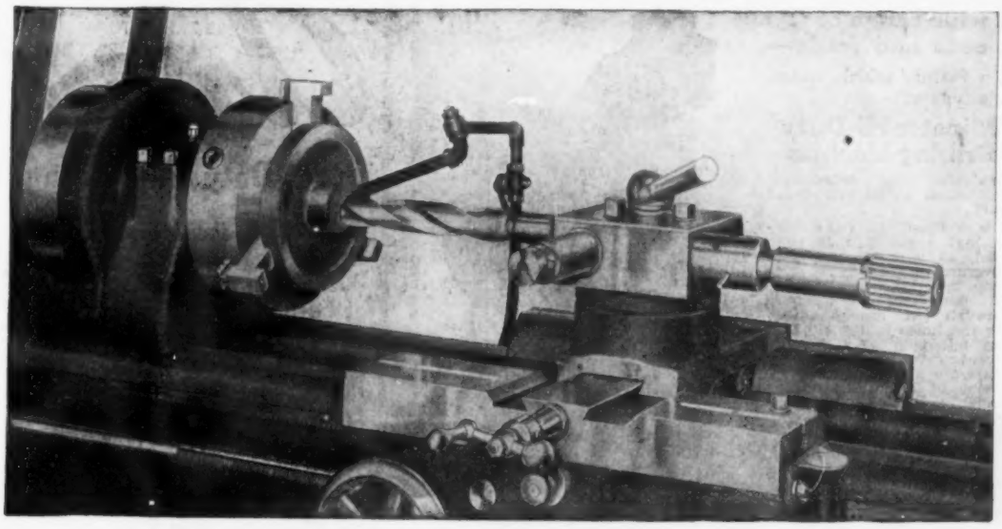
For Light, Intricate Drilling Jobs

This Fox Multiple is just the thing. It is a sensitive, small, yet inexpensive machine that will take care of much of the work being done on heavier machines. For unusually complicated layouts the use of Chester Plates with it is recommended, as they make possible universal horizontal adjustment for arms and vertical adjustment for spindles.

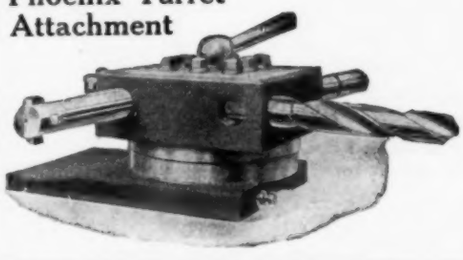
The D-01 Drill illustrated has a head which permits spindles to cover an area 12 in. diameter, machine can be equipped with six spindles 1⅛ in. diameter, drilling ½ in. holes in cast iron, the closest centers between holes being 1 5-32 in.



FOX MACHINE COMPANY
1803 W. Ganson St., Jackson, Mich.
Formerly of Grand Rapids, Mich.



Phoenix Turret Attachment



Slips right on the carriage—

This Phoenix Turret Attachment slips right on the carriage of your engine lathe. It is designed to carry boring bars, drills or reamers from 1¼ to 3 inches in diameter. It has proven a valuable time saver and a most economical tool in shops throughout the country.

On some classes of work it will produce as much work as a complete high-grade turret lathe, and in some cases work can be finished before a turret lathe could be started.

The locking device, which locks the tools in position, can be released by a three-quarter turn of the handle.

Write us for full particulars today.

Phoenix Manufacturing Co., Eau Claire, Wis.
Eastern Representative: W. L. Harrison, 913-915 Engineers Bldg., Cleveland, Ohio

The Edlund

No. 2B

Quick-change, high-speed, high-grade, Ball Bearing, Sensitive Drilling Machines are built in combinations of from one to six spindles.

The operator makes all speed changes of which there are four from the natural working position without stopping the machine.

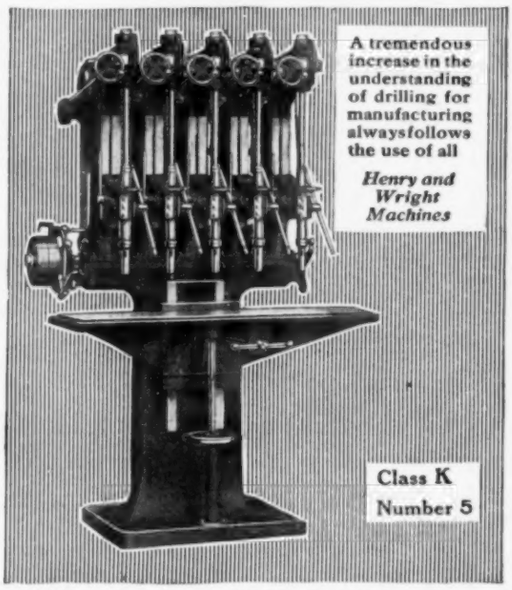
Ten S.K.F. Ball Bearings are used for each spindle.

It has other desirable features equally as important to quick and accurate drilling.

Get our catalog. It gives all the details.

Edlund Machinery Co., Inc.
Cortland, N. Y.

HENRY & WRIGHT
Drilling Machines



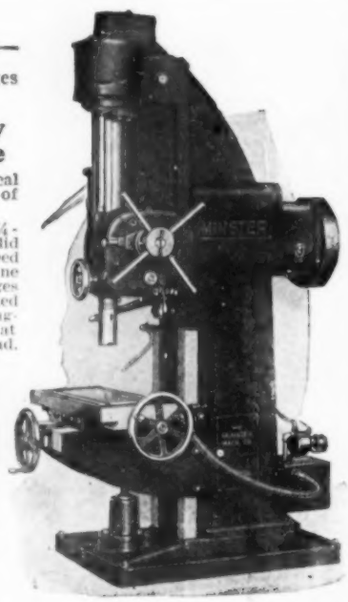
A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.
Foreign Agents: Allied Machinery Co. of America, New York, N. Y.
Paris, Turin, Zurich and Barcelona

A wide range of speeds and feeds—
is a feature which makes this type of

Minster Hi-Duty Drilling Machine



invaluable for economical production on a variety of work.

It is designed to drive a 3¼-in. high speed drill, in solid steel, at a speed and feed governed by modern machine shop practice. Six changes of speed can be obtained through two cranks engaging the holes in the dials at the left side of the head. Direct drive and back gears are also engaged by means of a crank, conveniently located.

Twelve regular feeds are provided to take care of all drilling and reaming needs, and are controlled by means of small levers in the front of the machine.

Minster Hi-Duty Drilling Machines are made in three sizes—Nos. 1, 2 and 3.

Write for our circular for complete details.

Minster Machine Co., Minster, O.

Barbour, Love & Woodward Co., 149 Broadway, New York City; Machine Tool Engineering Co., 149 Broadway, New York City; Syracuse Supply Co., Syracuse, N. Y., Buffalo, N. Y., Rochester, N. Y. Monarch Machinery Co., Philadelphia, Pa.; J. S. Miller Machinery Co., Pittsburgh, Pa.; Cleveland Tool & Supply Co., Cleveland, O.; E. A. Kinsey Co., Cincinnati, O.; Indianapolis, Ind.; W. J. Baird Machinery Co., Detroit, Mich.; McMullen Machinery Co., Grand Rapids, Mich.; Federal Machinery Sales Co., Chicago, Ill.; Milwaukee, Wis.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; Herberts Machinery & Supply Co., San Francisco, Cal.; Los Angeles, Cal.; Wilcken-Schenck Co., Seattle, Wash.; Zimmerman-Wells-Brown Co., Portland, Ore.; Manufacturers' Selling Agency, Birmingham, Ala.; Henri Benedictus, 133 Rue du Progres, Brussels, Belgium; Coats Machine Tool Co., 14 Palmer St., London, England; Pedro Merlini, Buenos Aires, Argentine; Quinones Hardware Corp., Havana, Cuba; Williams & Wilson, Ltd., Montreal, Quebec.

Avey No. 3

Heavy Duty Ball Bearing Drilling Machine

Designed for quantity and quality production on all classes of drilling. Much higher speeds can be obtained than ordinarily used for holes from ¾ in. to 1⅛ in., combined with finer feeds, makes a production increase of from 25 to 50 per cent. possible.

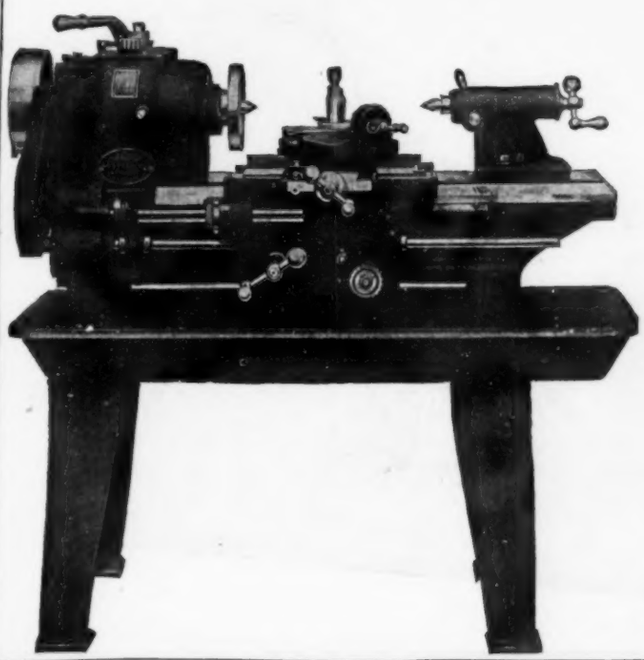
Built in combinations of one to six spindles with plain hand or power feed. Ball bearings throughout.

Write for Bulletin containing details

Our No. 3 machine provides maximum speeds for work up to 1⅛ in.

The Cincinnati Pulley Machinery Co.
Cincinnati, Ohio

In our own shop experience on small lots we are able to exceed engine lathe production by 50% with its use.



"Adams Short-Cut Lathe"

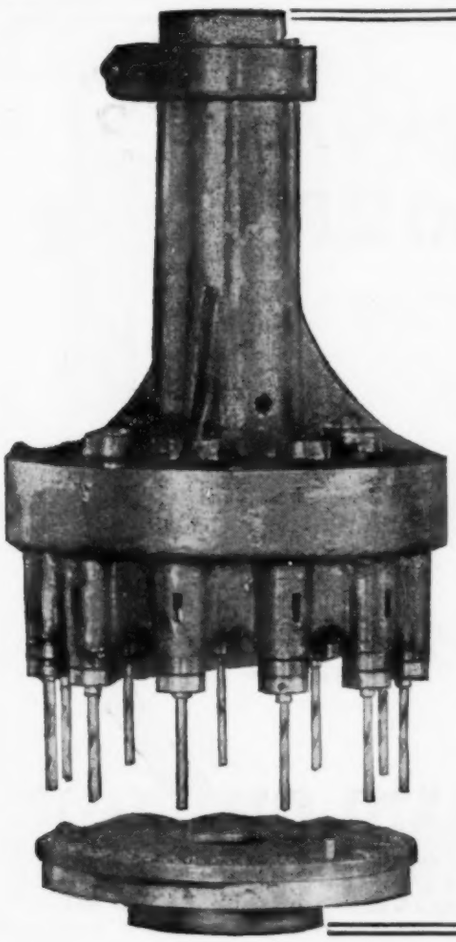
Powerful geared head with six speeds. All gears run in oil. Handles arranged to simplify control. Massive crossbridge with compound rest arranged so that handles will not interfere. Tailstock spans the bed, making lathe capable of taking cuts possible on a 16-in. machine. Oil pan bed. Swing 13⅝ in.; 19 in. between centers. Weight 1350 lb.

Occupies less floor space. Convenient for roughing out work.

Take the short-cut to economy. Write today.

O. R. Adams Mfg. Co., Inc.
Rochester, N. Y.

Represented by the Fairbanks Co., Boston, New York and Baltimore; Ogden R. Adams, Syracuse, Rochester, Buffalo; Laughlin-Barney Machinery Co., Pittsburgh; Federal Machinery Sales Co., Chicago, Ill.; Herberts Machinery & Supply Co., Los Angeles, Calif.; Riverside Machinery Depot, Detroit, Mich.; W. M. Pattison Supply Co., Cleveland, Ohio; Allied Machinery Co., Paris.



Speed Up the Work

Rising costs are knocking the bottom out of profits these days!

Materials and labor are up. No chance to reduce them. But you can speed up your work. The Hoefer Manufacturing Company has a proposition that will cut your drilling cost. Not guess-work either, but on a basis proved by experience.

By using Hoefer Auxiliary Heads you can drill ten, twelve or more holes in the same time as one. Not only do you save the drilling time, but also the time lost shifting the jigs and raising and lowering the spindle for the extra holes.

360 manufacturers—99 distinct lines of business—probably some of your competitors—employ Hoefer Auxiliary Heads to increase profits. They say the Hoefer Auxiliary Heads pay for themselves in 30 to 60 days.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. Made by expert tool makers and guaranteed to handle accurately the work for which they are designed.

Investigate now. Stop the leakage of dollars due to the use of single drills. Write for catalog and send blueprint of some of your work for estimate of time and cost.

The Hoefer Mfg. Company
Freeport, Ill.

HŒFER
AUXILIARY HEADS

621 Washington Blvd., Phone—Haymarket 2408, Chicago, Illinois. 1113 Citizens Bldg., Phone—Main 795, Cleveland, Ohio. 708 Empire Building, Phone—Court 1911 or 1912, Pittsburgh, Pa. 602 Kerr Building, Phone—Cherry 2884, Detroit, Michigan. 30 Church Street, Phone—Cortlandt 1615, New York City. Badger-Packard Mchy. Co., Milwaukee, Wis., National Supply Co., Toledo, Ohio.

Save Money on Big Jobs—

Put them on a P & H Horizontal Boring and Drilling Machine.

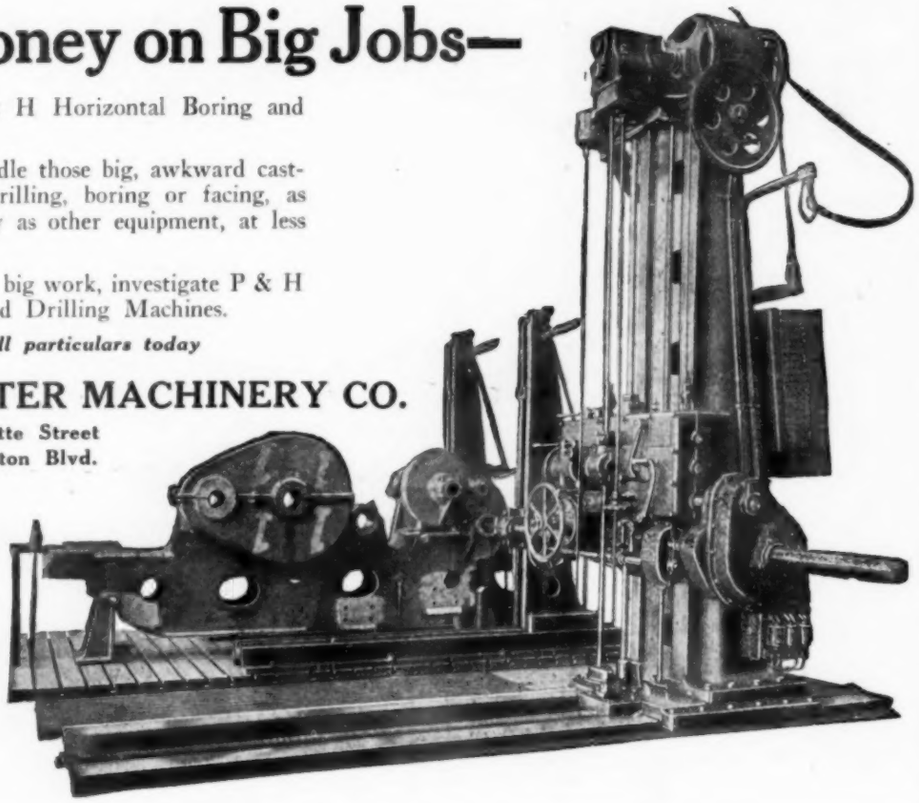
The P & H will handle those big, awkward castings which require drilling, boring or facing, as quickly and accurately as other equipment, at less cost.

For big production on big work, investigate P & H Horizontal Boring and Drilling Machines.

Write for full particulars today

DALE-BREWSTER MACHINERY CO.

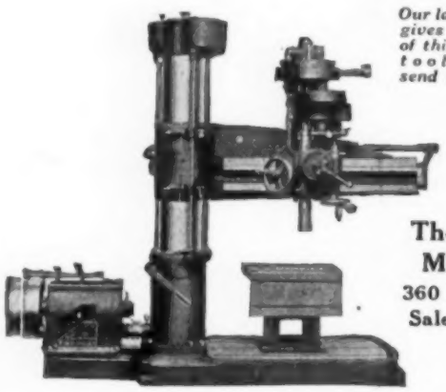
New York: 55 Lafayette Street
Chicago: 542 Washington Blvd.



QUALITY P&H SERVICE

SILVER
Radial Drills

are strong, simple and convenient. They are the product of a plant that has been turning out drilling machines for over 65 years. They have every feature necessary to easy operation and are so designed and constructed as to stand up to severe service over long periods. Silvers are extremely flexible and will prove to be the most sought after machines of their class in your shop.



Our latest circular gives full details of this modern tool. May we send it?

The Silver Mfg. Co.
360 Broadway
Salem, Ohio

the first to reach

10,000 R.P.M.

We were the first to manufacture drilling machines with spindle speeds ranging from 3000 to 10,000 r.p.m., a development in the manufacture of high-speed drills that means increased output and greater economy in the production of duplicate parts in your shop.

The high-grade annular ball bearings with which they are provided throughout assures speed without vibration, thus making them particularly desirable for precision drilling. Furnished in from one to six spindles.

May we send complete details?

Leland-Gifford Co.
Worcester, Mass.

LELAND-GIFFORD

A Machine Designed and Built by Men Who Know

No matter who grinds your drills, they cannot possibly be ground wrong, provided they are ground on an American Drill Grinder.

This is a machine which is made by men who specialize on the one thing. Their object is to make grinders just a little better than others, and to sell them at a price which is based not what they think they can get for them, but on what it actually costs to build, sell, and deliver.

American Drill Grinders are the product of many years of close study and comprehension of the needs of machinists. They are rigid of construction, simple of design, equipped with every means of promoting efficiency, yet there are no unnecessary parts on them which are apt to cause delay, annoyance, and make operating difficult.

You will learn why drills are sharpened so well on this grinder when you see our literature, which goes into further detail. A post card will bring it to you.

American Drill Grinder—Style W T A equipped with V-trough Drill Holder. Belt or motor driven; can be used for wet or dry grinding. Capacity—¼ in. to 2½ in.

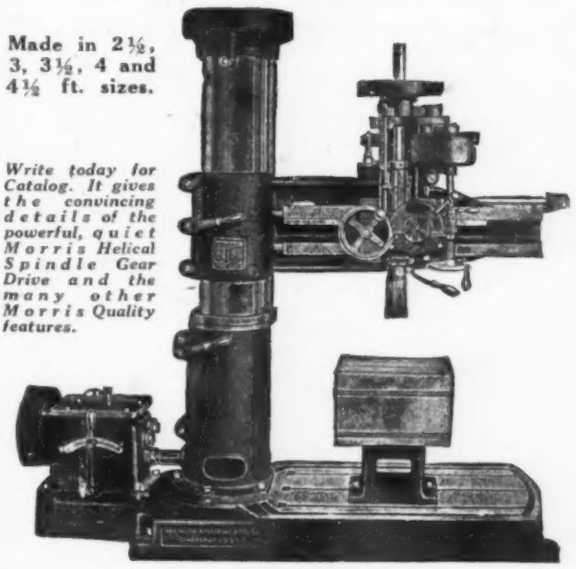
La Salle Tool Co.
La Salle, Ill.

Formerly La Salle Machine & Tool Co.

QUANTITY and QUALITY PRODUCERS

MORRIS RADIALS

Made in 2½, 3, 3½, 4 and 4½ ft. sizes.



Write today for Catalog. It gives the convincing details of the powerful, quiet Morris Helical Spindle Gear Drive and the many other Morris Quality features.

The Morris Machine Tool Company
Cincinnati, Ohio

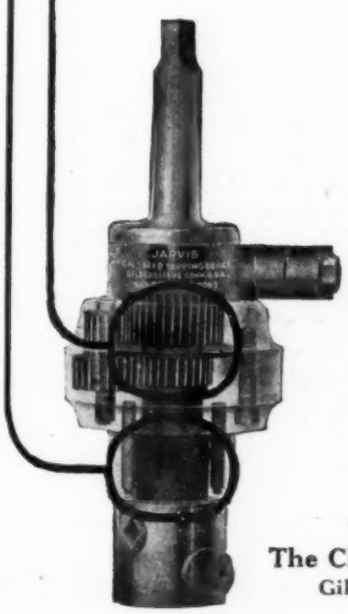
Niles, Bement, Pond Co., 111 Broadway, N. Y.

The Ball Drive and Ball Reverse

of the

JARVIS

High Speed Tapping Device



is what makes the Jarvis so distinctive and so superior to any other tapping device on the market. It eliminates all possibility of clinching and binding, which means a big saving in the expensive item of tap breaking. It will never stop rolling when started and operates as easy as "rolling off a log."

The ball drive is direct and runs at any speed the drill press or lathe spindle runs. When the required depth has been reached, the reversing balls are easily and quickly thrown into operation giving the tap automatic, rapid reverse motion.

By the use of the Jarvis High-Speed Tapping Device, you can drill, ream, counterbore and tap on a 4-spindle drill press, all with one setting of the jig.

Send for folder.

The Chas. L. Jarvis Co.
Gildersleeve, Conn.

If a Spindle Belt Gives Out

on this machine it can be Renewed in 10 Seconds

ITS A TRADE MARK SIPP

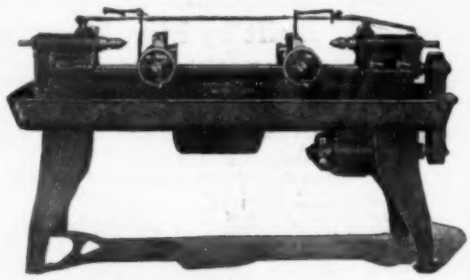
How Long Does It Take
on the machine you are using?
Write for Bulletin No. 4

The Sipp Machine Co.
Erie R. R. Ave., Paterson, N. J.

CADILLAC DOUBLE-END DRILLING AND CENTERING MACHINE

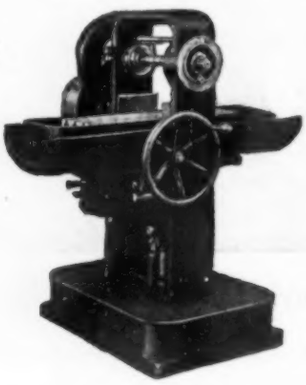
You can increase your output 100% with the Cadillac. Wherever drilling or centering is required at opposite ends, this double-end design can handle both jobs simultaneously. 12, 24, 36, 48 or 60 inch work can be handled between centers. For longer pieces remove the left hand head. Belt or motor driven.

Find out about the Cadillac today.



THE CADILLAC TOOL COMPANY
Detroit, Mich.

Briggs **Miller**



For the rapid, accurate production of gang milling and other jobs of heavy work the Briggs Heavy Duty Miller is supreme. It is built to stand the strain and retain its accuracy. It is valuable both for tool room and shop. Write for particulars.

Gooley & Edlund, Inc.
Cortland, New York

DOMESTIC AGENTS: Cleveland Tool & Supply Co., Cleveland, Ohio; Blackman-Hill-McKee Machinery Co., St. Louis, Mo.; Lund-Farquhar Co., Boston, Mass.; Vandyck-Churchill Co., New York City and New Haven, Conn.; Monarch Machinery Co., Philadelphia, Pa.; Syracuse Supply Co., Syracuse, Rochester and Buffalo, N. Y.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; English & Miller Machinery Co., Detroit, Mich.; Federal Machinery Sales Co., Chicago, Ill.; Vonnegut Machinery Co., Indianapolis, Ind.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona

TURNER TURRET

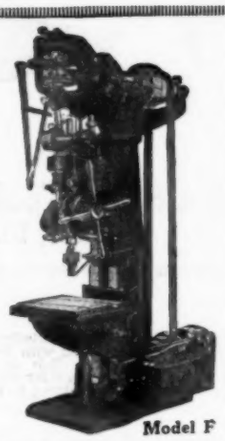
Completes the job in one set-up

It has the accuracy and convenience of the best type turret lathe. From 4 to 6 spindles carrying different tools register in precisely the same position for succeeding operations.

No lost time resetting. Safe in the hands of the most inexperienced.

Write for Bulletin A. M.

Turner Machine Company
Danbury, Conn., U. S. A.



Model F

Where Better Drilling Is Desired

Accuracy and fine finish and workmanship distinguish Sigourney Drill Presses. They are the finest built Sensitive Drilling machines on the market. Guaranteed to run absolutely true. Made with one, two, three and four spindles.

Write for Illustrated Catalog.

The Sigourney Tool Co.
Hartford, Conn.

Tuttle Tappers

No. 1 Machine for Hand Lever Operation

Pressure on the chuck spindle starts the "Tuttle"; pressure on the lever stops it.

When the depth for which the machine is set is reached, the "Tuttle" automatically stops the travel of tap and saves spoiled work and broken tap.

The operations are simple, but they were never worked out before.

There are two Tuttle Tappers: No. 1 for hand lever operation. No. 2 for foot lever operation. Illustration shows No. 1 machine.

Write for Booklet showing both styles.

EVANS STAMPING & PLATING CO., Taunton, Mass.

Greater Accuracy—

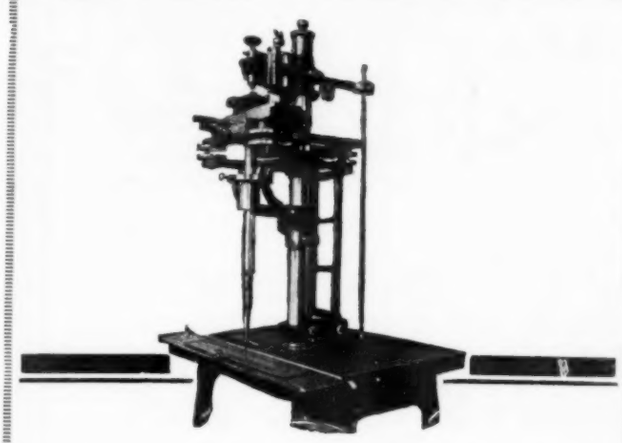
on work requiring various operations such as drilling, reaming, counterboring, etc., by doing it all in one operation on your drill press with a

Fortin Turret Drill Head

This device converts your single-spindle drill to a five-spindle drill. By means of a lever located on the front of the turret head, the operator can swing any tool in position for operation.

May We Send Details?

THE SPAFFORD TOOL WORKS
Hartford, Conn., U. S. A.



Engrave Your Own

Here is an engraving machine that has been designed especially for shops that would do engraving at home if it were found to be more economical. This machine is of the routing type having a rapidly revolving cutter driven by an electric motor.

It is designed to accurately and speedily engrave steel, brass and other metals.

The money this machine will save you on your engraving will soon more than pay for it.

Complete details upon request.

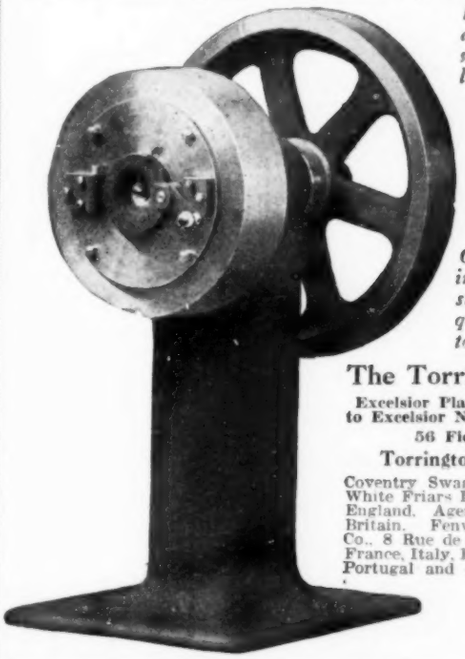
Engravers & Printers Mach. Co.
Sag Harbor **New York**

From 2000 to 6000 Blows Per Minute

Dayton Swaging Machines make metal more solid, tougher and more elastic. It is the series of quick, forceful, squeezing hammer blows—from 2000 to 6000 per minute—that makes the "Dayton" so superior.

This kneading performance—peculiar to the "Dayton"—holds the metal together and prevents crystallization.

Write us about your swaging problems.



Our interesting Bulletin is sent upon request — write today.

The Torrington Co.
Excelsior Plant—Successor to Excelsior Needle Company
56 Field St.
Torrington, Conn.

Coventry Swaging Co., Ltd., White Friars Lane, Coventry, England, Agents for Great Britain. Fenwick Freres & Co., 8 Rue de Rocroy, Paris, France, Italy, Belgium, Spain, Portugal and Switzerland.

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MARKS'

MECHANICAL ENGINEERS' HANDBOOK

The authoritativeness of this book is accepted wherever data on mechanical engineering are required. If you can say "I saw it in Marks"—depend upon it your information is right.

All over the world men who use mechanical engineering data are turning to "Marks." This wide demand has brought the total issue up to 40,000 in three years. The four big reasons for this success are:

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Four Indexes—The book is thumb-indexed for sections; a list of the section subject headings is given; the first page of each section gives a list of the topics treated; in the back of the book there is a big general index.

Every-working-day Usefulness—The information has been discriminatingly selected. It is the essence of modern theory and practice in mechanical engineering.

Let us send you a copy for ten days' free examination. This will give you an opportunity to see for yourself how useful "Marks" could be to you.

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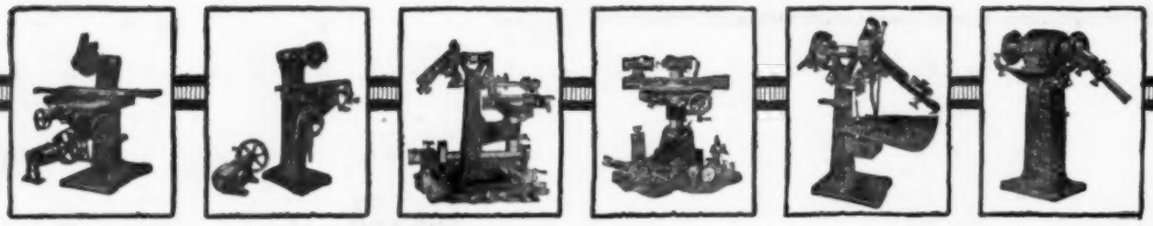


MANUFACTURERS OF SURFACE GRINDERS, UNIVERSAL CUTTER & TOOL GRINDERS & DRILL GRINDERS

Precision Grinding Machinery

WILMARTH & MORMAN CO.

The New Yankee Drill Grinders

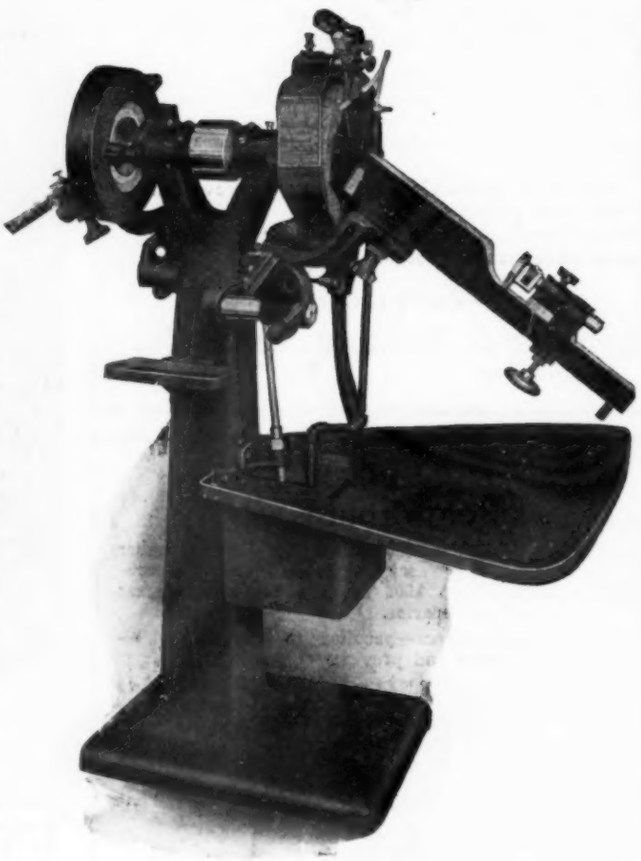
take all the grind out of drill grinding.

Their construction is strong and simple, involving special improved features which have made them of exceptional value to over 13,500 manufacturers.

The drill is held firmly so that accurate grinding is assured in the least possible time, resulting in a considerable annual saving of drills.

These drill grinders can be operated by the youngest apprentice boy, saving the time of machinists and increasing the productive capacity of the shop.

May we send Catalog No. 1001?



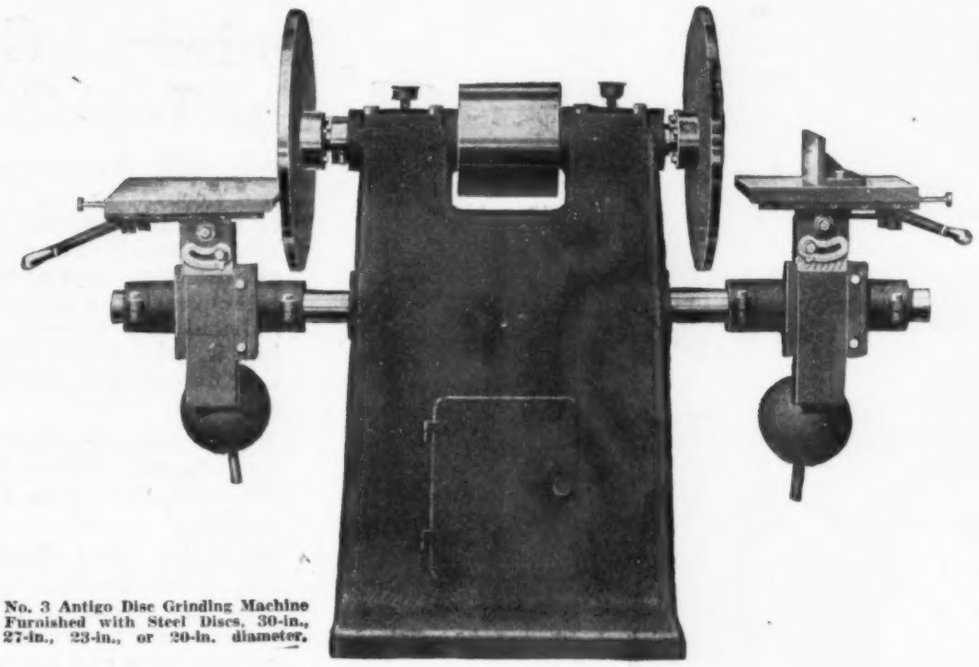
Style "W P L" New Yankee Drill Grinder. Capacity No. 52 to 2¼-inch Drills.

WILMARTH & MORMAN CO.

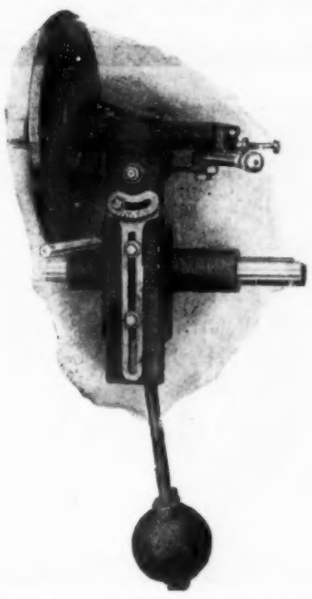
MASTER GRINDER MAKERS

FOREIGN REPRESENTATIVES IN ALL PARTS OF THE WORLD

1187 MONROE AVE., N.W. GRAND RAPIDS, MICH.



No. 3 Antigo Disc Grinding Machine Furnished with Steel Discs, 30-in., 27-in., 23-in., or 20-in. diameter.



The Universal Lever Feed Table is indispensable when a considerable quantity of stock is to be removed and where it is desired to produce duplicate parts in large quantities. The table oscillates on a rockershaft and an adjustable counterweight allows a correct balance to be maintained. Top of table has "T" slots for attaching fixtures and has an adjustable stop graduated in thousandths of an inch. The table can be tilted to 45 degrees and has a vertical adjustment of 4½ inches.

There's character to the

ANTIGO

Disc Grinding Machine

The enormous belt strength (251 square inches of belt surface passes over the pulleys per revolution) of the Antigo Disc Grinding Machine is the factor which serves to give the most work for the power invested.

The two discs are the only working parts to this simple, powerful machine. There is nothing else about it to get out of order, hold up production, or cause annoyance.

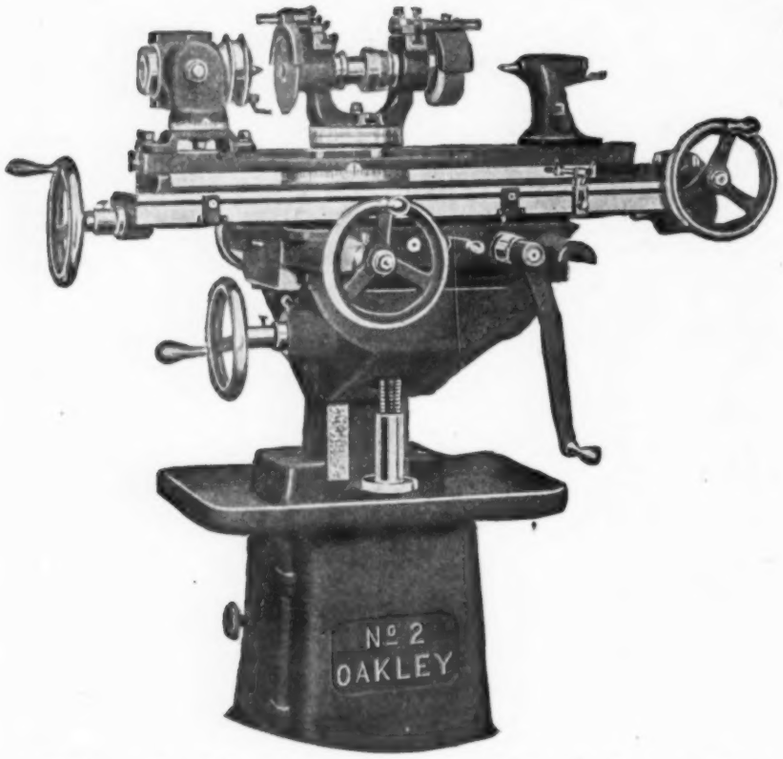
It is of standardized make.

Being a development from many years of experience in grinder building, the Antigo Disc Grinding Machine embodies every requisite of modern production methods, as well as a number of its own individual features. It is the logical machine for the shop where efficient, inexpensive production is sought.

Write to us for a candid opinion as to the adaptability of the Antigo to your own plant. Your inquiries will be welcome.

Murray-Mylrea Machine Co.
Antigo, Wisconsin

Agent for Michigan,
J. C. AUSTERBERRY, 65 Shelby St., DETROIT



Here is a

Universal Cutter and Tool Grinder

that will sharpen rapidly and accurately any style or shape of cutting miller. When furnished as a universal machine, equipped with attachment for surface, cylindrical and internal grinding it will grind all work that comes to the tool room, such as:

Jig Bushes, Straight Edges, Snap Gages, Slitting Knives, Reamers, Rose Bits, Formed Tools.

Its design gives the Oakley No. 2 an unusual rigidity. The arrangement of hand wheels and levers makes for convenience and accuracy in operation.

The Oakley Machine Tool Co., Cincinnati, Ohio, U. S. A.

WHEELS OF PROGRESS

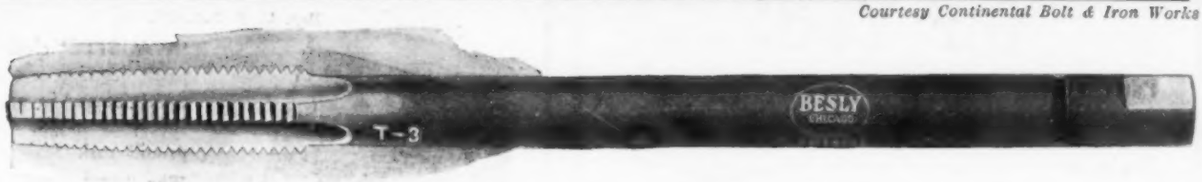
Superior Grinding Wheels

Truly they are wheels of progress. For years experts at our plant have indulged in progressive research with the aim always in mind of manufacturing a better product. The result of this labor seems to be what we desired for Superior Corundum Grinding Wheels are acclaimed as "mighty successful" by their many owners and users. These wheels are made by three processes—Vitrified, Silicate and Elastic and from either Natural or Artificial Abrasives. They are absolutely guaranteed to give complete satisfaction.

Instant deliveries assured!
Shall we send you our catalog and prices?

Superior Corundum Wheel Co., Waltham, Mass.

Courtesy Continental Bolt & Iron Works



Tapping the Big Ones

on Besly Tapper Taps

BESLY CHICAGO

Besly Taps are used exclusively in the plant of the Continental Bolt & Iron Works, Chicago. This concern has found them thoroughly satisfactory, reliable, and accurate.

In this particular instance, the record output per Besly Tap is 12,000 nuts per day—and that's saying a good deal, considering the fact that these nuts are 1½ inch.

Besly Taps are made in all standard sizes and styles for Machine Shops, Locomotive Shops, and Bolt and Nut Shops.

Ask for catalog.

CHARLES H. BESLY & COMPANY
124 N. Clinton Street, Chicago

INDIVIDUAL FEATURES OF THE WORCESTER

A Series of Ads to Describe, One at a Time, the Many Distinctive Features of the Worcester Internal Grinder.

The Work Head

is mounted on the table and is belted down in a straight line to the drum in the base. This method of driving insures that there is complete contact between base and table and eliminates all vibration from this source.

The Work Head swivels on the table 20 degrees each side of central position.

A vertical lever at the left hand side of the machine lifts the drum clear of the work head belt, enabling the operator to move table to any position when the machine is idle. This lever is so designed that by a spring lock ratchet only can the drum be lifted and held free from belt, but an even tension may be maintained on the belt when drum is in normal position.

The Work Head Spindle

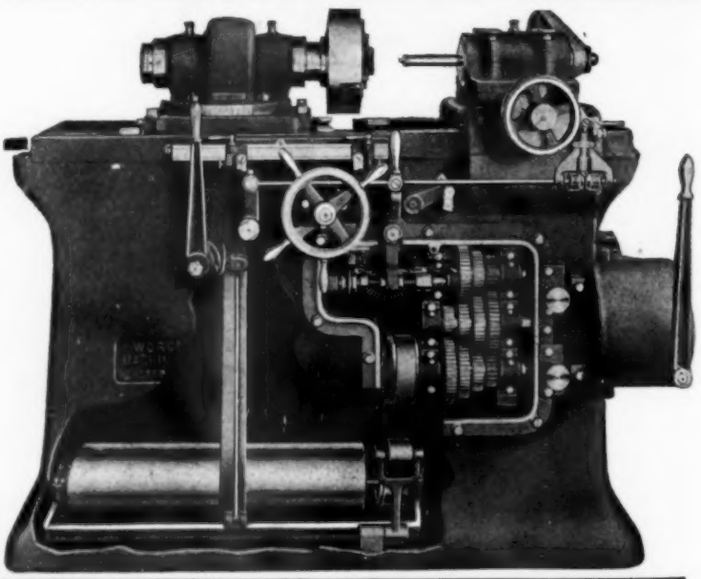
is mounted in Phosphor Bronze bearings tapered on outside and easily adjusted. The front bearing of spindle being 2¾-in. diameter x 5¾-in. long and the rear bearing 2½-in. diameter x 6¼-in. long and the rear bearing 2½-in. diameter x 6¼-in. long with pulley between bearings carefully guarded, the guard being easily removed when necessary.

The Wheel Head

is enclosed in a housing, from which it can quickly be removed and one of another size put in its place. This housing is secured to the cross slide plate by dovetail ways, clamped with suitable gibs and screws. This housing can be moved quickly in a cross-wise direction without using cross slide screw. The purpose of this is to give the additional travel to wheel head necessary when grinding 20 degree tapers and also to aid operator when two different diameters are to be ground at one setting.

This is the first ad of this series. A new feature in each one, but all are fully described at once in our bulletin. Your copy is ready for you.

WORCESTER MACHINE WORKS, INC.
PARK BUILDING, WORCESTER, MASS., U. S. A.



Here's the Sander for You!

Pattern shops all over the country are making large savings in time and labor with Syracuse Sanders.

The Syracuse Oscillating Spindle Sander shown here is portable, and equipped with New Departure ball bearings and General Electric motor.

The hand adjustment on the

SYRACUSE Spindle Sander

tilts the table 45 per cent. down or 15 per cent. up.

This machine is easy to operate and runs with absolutely no vibration.

We also manufacture a Disc Sander. Both machines can be plugged into the lamp socket.

Write for Bulletin illustrating and describing Syracuse Sanders.

Syracuse Sander Mfg. Co., Inc.
Syracuse, N. Y.

Great Britain Agent—Coats Machine Tool Company, Inc., 14 Palmer St., Westminster, London, S. W.

"WAUSITE"

Reg. U. S. Pat. Off.

"WAUSITE" cloth is a *fast cutting* abrasive which comes in standard sheets or in the "wasteproof" roll.

The "wasteproof" roll is a time saver in the shop. Just cut off a strip of desired length and use—no waste.

Write us today for details, working samples, and prices on "Wausite."

Wausau Abrasives Company
118 S. Clinton St., Chicago

GREATER SPEED HEAVIER CUTS

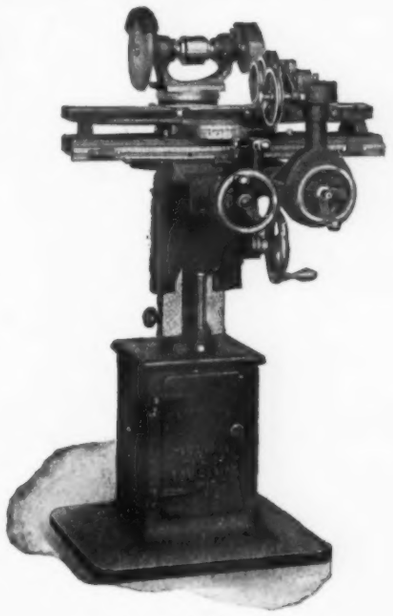
Possible on the

STERLING

Universal Cutter and Reamer Grinder

Through the use of ball bearings in the wheel spindle

Write for Catalog illustrating and describing the other Superiorities of the STERLING UNIVERSAL TOOL GRINDER



"Completely Universal"
FAST—ACCURATE—RIGID

McDonough Manufacturing Company MACHINE TOOL DEPARTMENT
EAU CLAIRE, WISCONSIN, U. S. A.

Dealers: Luster Machinery Company, 917 Arch Street, Philadelphia, Pa.; Manning, Maxwell & Moore, Inc., 119 West 40th Street, New York City; Wm. C. Johnson & Sons Company, St. Louis, Mo.; J. S. Miller Machinery Co., 3 Wood Street, Pittsburgh, Pa.; J. R. Patterson Tool & Supply Co., 121 Third Street Dayton Ohio; Homer Strong, Rochester, N. Y. Duplex Machinery Company, Cleveland, Ohio; David A. Wright, 568 Washington Blvd., Chicago, Ill.; Fairbanks Company, Baltimore, Md.

The Ott 6 in. x 6 in. Internal Grinding Machine

This tool is the result of a wide demand for an internal grinding machine that is of the simplest design possible. It incorporates every function within its rated capacity demanded in the rapid accurate grinding of straight and taper holes.

Its features are:

A nine inch adjustable collet chuck with quick acting closing device.

A ball bearing wheel spindle with three self-aligning S.K.F. bearings positively protected, by patented applications, against dust and grit, with spindle speeds of 8,000 to 20,000 R.P.M.

It grinds holes up to six inches in diameter and six inches deep, and will swing work up to twelve inches in diameter.

Work speeds are 85 to 425 R.P.M. and table feeds are 16 in. to 50 in. per minute.

Floor space, 38 in. x 70 in.

You will be interested in Bulletin 6 describing fully all the features of this tool. We will be glad to send you one at once.

OTT GRINDER CO.

217 W. Tenth Street, Indianapolis, Ind.

REPRESENTATIVES: McMullen Machinery & Supply Co., Grand Rapids, Mich.; Ogden R. Adams, Rochester, N. Y.; Cadillac Tool Co., Detroit, Mich.; Cleveland Tool & Supply Co., Cleveland, Ohio; Coghlin Machinery & Supply Co., Toledo, Ohio; Machine Tool Engineering Co., New York, N. Y.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; Syracuse Supply Co., Syracuse, N. Y.; Dale-Brewster Machinery Co., Chicago, Ill.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; Swind Machinery Co., Philadelphia, Pa.; L. S. DeVos, New York, N. Y.; Bernard E. Mohr, St. Louis, Mo.; F. O. Stallman Supply Co., San Francisco, Cal.; Barbour-Love & Woodward, Inc., New York, N. Y.; Selson Engineering Co., England, France and Italy.

Reduces the Cost of Tool Grinding

and makes the work easier. It is a most convenient and smooth running machine and has an unusually wide range of application.

There are many features worth knowing about.

Write for folder

Warren F. Fraser Co., Westboro, Mass.

A Grade for Every Metal

It is impossible to produce a metal that VITRIFIED WHEELS cannot cut. They are extremely porous and, therefore, best adapted for tool grinding.

Vitrified Wheels

are made in grains and grades, sizes and shapes to suit every grinding need. VITRIFIED mixtures are such that every part of their makeup has cutting qualities. You will greatly increase production and improve the quality of your product if you specify VITRIFIED WHEELS. Our range is wide. Send for the stock list and note it.

Vitrified Wheel Company
Westfield, Mass.

We Build Them By Hundreds

And so we can sell a superior machine at a moderate price without sacrificing any of the advantages of the more costly machines.

THE WATERBURY GRINDER grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

Let your stock boy grind your drills

Don't have a high salaried machinist waste his time that way when it is not necessary. With the

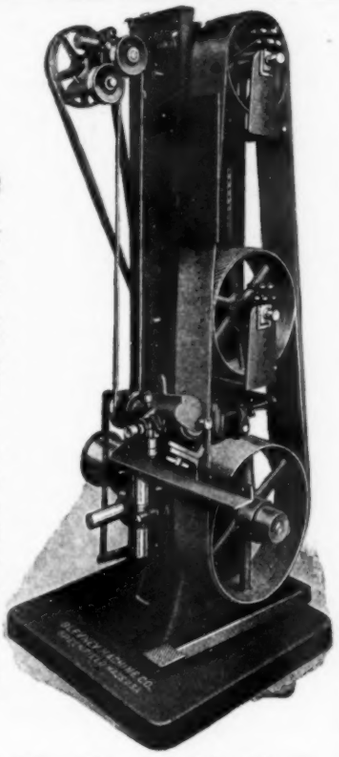
Grand Rapids, Double Holder Double Duty, Drill Grinder

your stock boy can keep your drills sharpened better than an expert machinist can sharpen them by hand. The machine mechanically insures them being correctly ground and with the removal of a minimum of stock from the drill. And it is fool-proof.

Write for our Catalog full of convincing details

Grand Rapids Grinding Machine Co.
33 Ottawa Ave., N. W.
Grand Rapids, Michigan
U. S. A.

Superior Finishing at a Rapid Rate



The Blevney Patent Two-Belt System produces a superior finish on metals, rubber, fibre, etc., and yet it can be operated at astonishing speed by an unskilled operator.

The two-belt system of an abrasive cloth belt running over a corrugated leather belt is what gives the Blevney its great speed and also helps to obtain the fine finish.

Get all the facts about this rapid machine.

Blevney Machine Co., Greenfield, Mass.

Cadillac Tool Co., Detroit, Agents for Michigan.
Over-seas Representative, Allied Machinery Company of America, Paris, Turin, Zurich and Barcelona.
Federal Machinery Sales Co., Chicago, Ill.; Milwaukee, Wis.

This Grinder Starts and Stops Instantly

EFFICIENCY and economy go hand in hand in the design of the

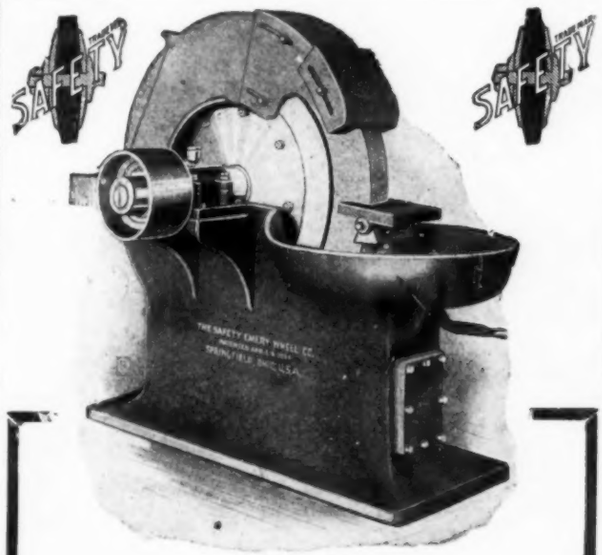
Marschke Economy Motor Driven Grinder

It is controlled by means of a foot pedal. The minute the operator steps on this pedal the "Marschke" starts off at full speed and when he is through he simply walks away; taking his foot off the pedal automatically stops the grinder.

There is no time lost, no power wasted. The "Marchke" Grinder is most economical for your shop.

Let us send you full details.

Marschke Manufacturing Co.
Successor to Standard Machine & Electric Co
Indianapolis, Indiana



Better Ground Tools

Nothing irritates a workman more than poorly ground tools. He can't keep up his production record and the quality of his work is below standard. Poor grinding is sometimes the result of carelessness but usually is due to imperfect grinding equipment. The "Safety" insures uniform grinding and lessens costs.

Do you have our Catalog?

The Safety Emery Wheel Co.
Larch Street, Springfield, Ohio

Bears the Brunt of Your Grinding Work

Diamond Grinders

There is just the proper kind of a Diamond Grinder for every grinding job, a grinder that will bear the burden of your grinding requirements.

Send for Bulletins on Floor, Disc, Hand and Automatic Surface, Heavy Face and Wet Tool Grinders.

10-inch Standard Grinder on Column

Diamond Machine Co.
Providence, R. I., U. S. A.

The N. & W. Automatic Surface Grinder

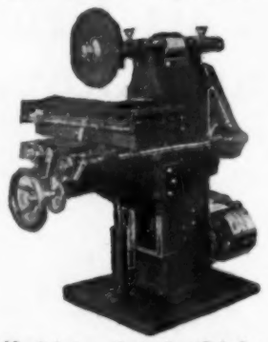
Its original accuracy is maintained by the sturdy dust-proof construction.

Thrust Ball Bearings used in the raising and lowering device. Slides and spindle have take-up bearings. Spindle is of best crucible steel.

A SAFE GRINDER: cross slide has automatic stop. The platen can be operated independently of spindle or any other part of machine.

Let us tell you all about this Surface Grinder

Noble & Westbrook Mfg. Company
19 Asylum Street
Hartford, Connecticut



No. 2 Automatic Surface Grinder

How Big is Your Shop ?

No matter what its size, it is just as much in need of the Lafayette Universal Grinder as the other fellow's. If you do Thread, Plain Surface, Internal, Cylindrical or Tool and Cutter Grinding you are losing money by not installing it. It is properly designed, carefully constructed and long lived. Countless operations of practically any nature come within its range. Send for circular and price list—you will be interested.

General Sales Office
LAFAYETTE **Tool & Equipment Company**
21 So. 12th St., Phia., Pa.
Works, Lafayette, Ind.

You Need An Outfit

If you have assembling to do you need this outfit. It will speed up the driving and setting of Bolts, Nuts, Screws, etc., by 50%. Work does not have to be "gone over."

Ask us why!

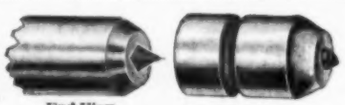
Hergi Mfg. Co.
75 3rd St.
Bridgeport, Conn.
FOREIGN AGENTS: Goodchild & Partners, Ltd., London, England; Atlantic Baltic Co., Ltd., Copenhagen, Denmark.

HAMPDEN Grinding Wheels

A Wheel For Every Purpose

Hampden Corundum Wheel Co.
Springfield, Mass

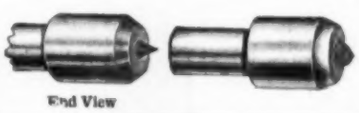
Keep Your



End View

Grinding Wheels True

With FRANCIS Diamond Grinder Tools. They are widely used, and always give satisfaction. Nothing but the hardest and best quality diamonds used. Tools for Norton and Landis Grinders, also Hand Tools and Tools of all descriptions. Ask for circular and prices. Allow us to send you an assortment for selection at our expense both ways.



End View

Francis & Co.
Established in 1799.
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A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding.

An all-around machine for your tool-room.

Catalog No. 6.

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Woods Swivel Head Universal Grinder

Combines many features designed to save time, labor, and money. Has a wide range and answers nearly every need of the tool room. An investigation will save you money. Think it over.

Allow us to send you full particulars.

The Woods Engineering Co.
Alliance, Ohio

Why Endure Boiler Scale and Waste Coal?

Do you realize that 1/16-in. depth of scale means a loss of from 10 to 15% in efficiency from a fuel standpoint? Get busy and call upon SOUTHER SERVICE to show you how to avoid scale and save coal.

The Henry Souther Engineering Co.
Consulting Engineers
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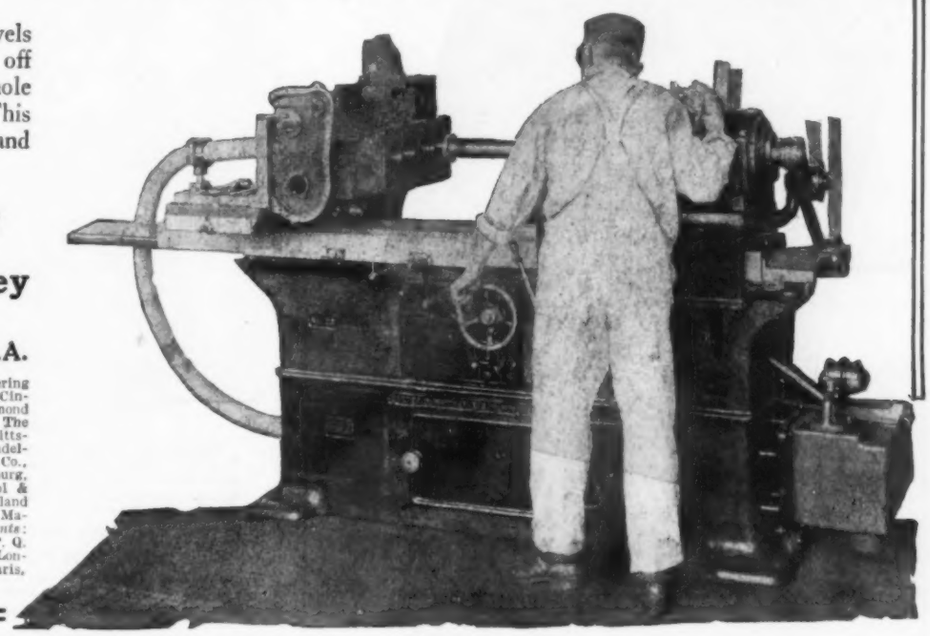
WHITNEY CYLINDER GRINDER

FOR GRINDING ALL KINDS OF GASOLINE ENGINE CYLINDERS AS WELL AS WORK TOO LARGE OR TOO HEAVY TO REVOLVE

The grinding wheel travels in a true circle and grinds off only enough to make a hole that is round and straight. This machine does the work right and does it quick.



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Domestic Agents: Machine Tool Engineering Co., New York City. E. A. Kinsey Co., Cincinnati, Ohio. Strong, Carlisle & Hammond Co., Cleveland, Ohio and Detroit, Mich. The Motch & Merryweather Machinery Co., Pittsburgh, Pa. Sherritt & Stoer Co., Philadelphia, Pa. Carey Machinery & Supply Co., Baltimore, Md. W. H. Savage, Fitchburg, Mass. *Pacific Coast Agents:* Pacific Tool & Supply Co., San Francisco, Calif. Portland Machinery Co., Portland, Ore. Perine Machinery Co., Seattle, Wash. *Canadian Agents:* Canadian Fairbanks-Morse Co., Montreal, P. Q. *Foreign Agents:* Buck & Hickman, Ltd., London, England. Fenwick Freres Co., Paris, France.

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are built with a knowledge gained thru seventy-four years of experience in the manufacture of high-grade machine tools. Thousands of our machines are daily giving satisfaction, a recommendation for our product that should not be overlooked when buying new equipment.

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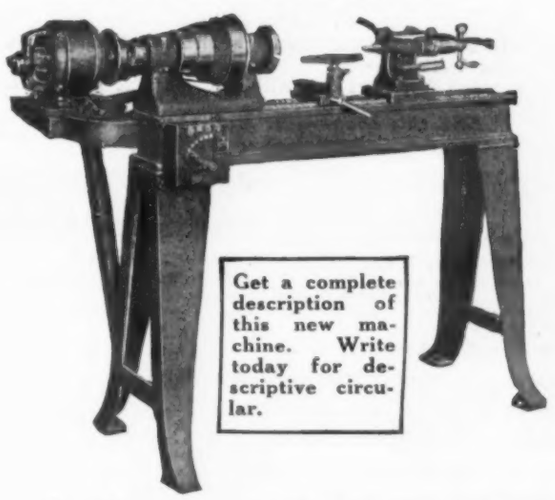
Blount Motor Driven SPEED LATHE

Has a constant speed motor mounted on a plate. The motor shaft is extended and the outer end is supported by a bearing. Cone pulley is provided on the motor shaft to drive the lathe spindle. Speed variations, same as when Countershaft is used.

Head fitted with four-step cone



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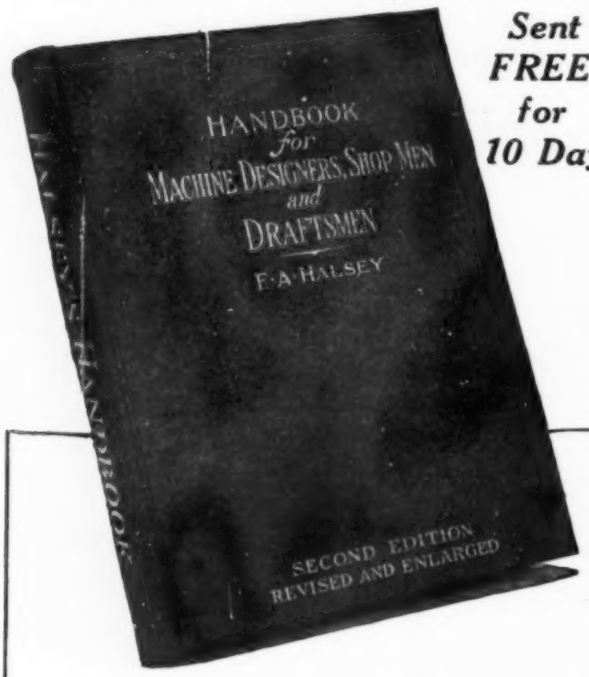

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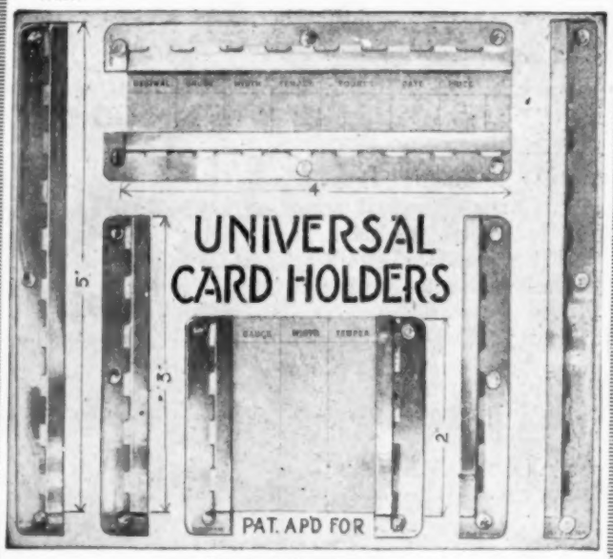
No Waste of Steel in Making the "Universal" Card Holders

Now you can label your stock bins, shelves, trucks, stock boxes, etc., with any size label you wish.
We carry four sizes in stock 2 in., 3 in., 4 in. and 5 in., other sizes to order.



Some Advantages:

One size holder can be used for **various size** cards, can be used either **in a vertical** or **horizontal** position, can be manufactured at a **small cost** hence **LOW PRICE.** Take up but **little room** in transit or store room. Permits the use of nearly the **entire card.** Card can easily **be put in** or **taken out.**

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(Makers of the Milling Machine Arbor Spacer)
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Sanford Quick Acting *Cam Vise*

A vise that is a combination of cam and screw principle. An easily operated, rapid and firm holding vise that is the choice of modern mechanics. **Get our catalogue.**

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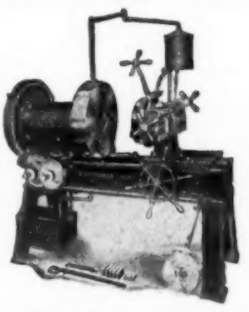
With this Improved No. 5 D Power and Hand Pipe Threading and Cutting Machine one man can quickly and easily thread or cut 6-inch pipe by hand. The machine is powerful, compact and very convenient. The journals are wide and tool slide has extra wide bearing surface.

All our machines and dies are thoroughly tested before shipment. We want to tell you all about them. Will you write for free catalog "M"?



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Plain Cylindrical
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For grinding wheels used for precision work there is nothing can substitute diamonds for keeping them accurately trued. We import only the best grade diamonds and we send unmounted diamonds on approval and will set them in any form or standard or special mountings according to your specifications.

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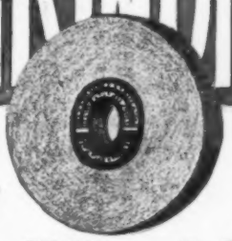

Oxaluma Wheels *for all Steel Grinding*

Carbora Wheels *for all Iron Grinding*

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ROTARY SURFACE GRINDER

A perfectly controlled precision machine, powerful and rigid enough to take maximum roughing cuts and then finish work to extreme limits. Indispensable to manufacturers of piston rings, thrust bearings, cutters, saws and the like. Write for catalogue.

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Manufacturers of
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Drill Two Holes for the Cost of One

You can do it with a Nelson two-spindle adjustable drill head.

Let us send you complete information.

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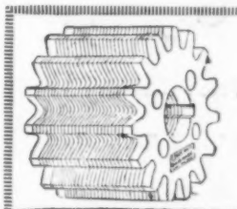

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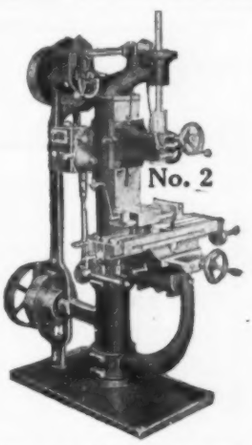
Both the No. 1 and No. 2 Knight Milling Machines are built on the same fundamental principles, the only difference being that the No. 2 is larger, and consequently suitable for a heavier grade of work than the No. 1. The No. 1, however, is fully capable of performing as wide a range of work of its class as is the other.



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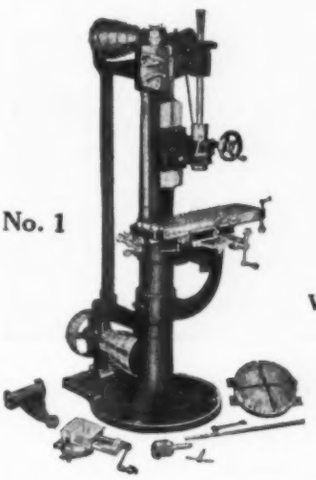

No. 1

You will find these two machines versatile, reliable, and accurate. Being suited for general shop and tool room jobs of miscellaneous sorts, as well as for large quantities of single purpose work, Knight Milling & Drilling Machines cover an exceedingly wide range.

Write to us and let us send you our leaflet, which gives tangible illustrations of what any good mechanic can do on the Knight Tilting Table.

W. B. Knight Machinery Company
3920 West Pine Blvd.
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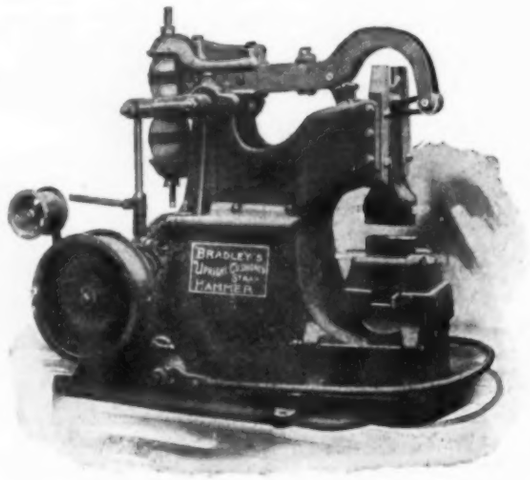
Foreign Representatives: Coats Machine Tool Co., Ltd., London, Glasgow, Newcastle-on-Tyne; Allied Machinery Company of America, France, Spain, Portugal, Italy, Switzerland, Norway, Sweden, Denmark and Belgium.



There Is Force and Power in this Bradley Hammer

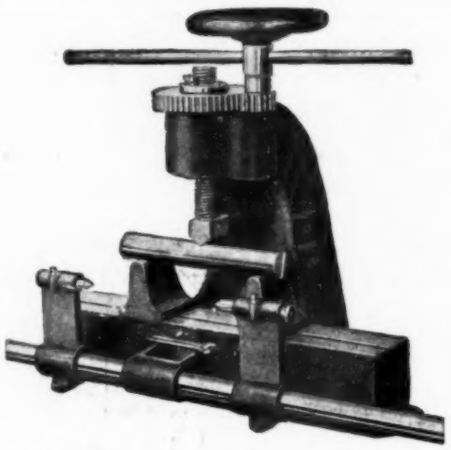
Bradley Hammers are unusually powerful—that is why they are so valuable for the rapid production of big duplicate parts and like work. They are accurate and convenient too.

Send for our catalog

C. C. Bradley & Son, Inc., Syracuse, N. Y.

England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Paris, Lyons, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland; Fenwick Freres & Co., Zurich; Portugal, Fenwick Freres & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona; Alsace-Lorraine, Fenwick Freres & Co., Luxembourg; China, Anderson, Meyers & Co., Ltd., Shanghai.

Geier Straightening Presses



Scientific management is based principally on the use of labor-saving equipment for reducing production costs. Geier Straightening Presses will quickly pay for themselves in any shop by reducing labor and saving good material from the scrap pile.

Catalog on Request.

THE P. A. GEIER COMPANY
5102 St. Clair Ave., Cleveland, Ohio

Sullivan Utility Air Hammers

will do the little forging jobs in your shop or yard quickly and cheaply.

They handle any work up to 2-in. diameter. The throat is 15-in. deep.

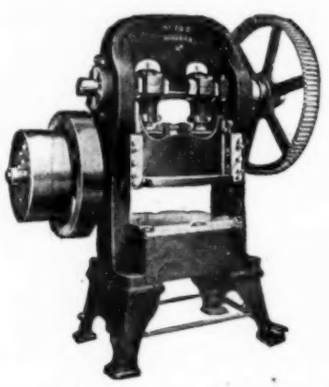
600 blows per minute.

Ask for Bulletin 720-D

Sullivan Machinery Co.
122 S. Michigan Ave., Chicago

Niagara Double Crank Presses

are the ideal heavy duty machines. They are most powerful and speedy. Slide motion is obtained by a double crank, insuring an evenly distributed pressure. They mean a large output at low cost.



Ask for Copy of Complete Press Catalog

Niagara Machine & Tool Works
Buffalo, N. Y., U. S. A.

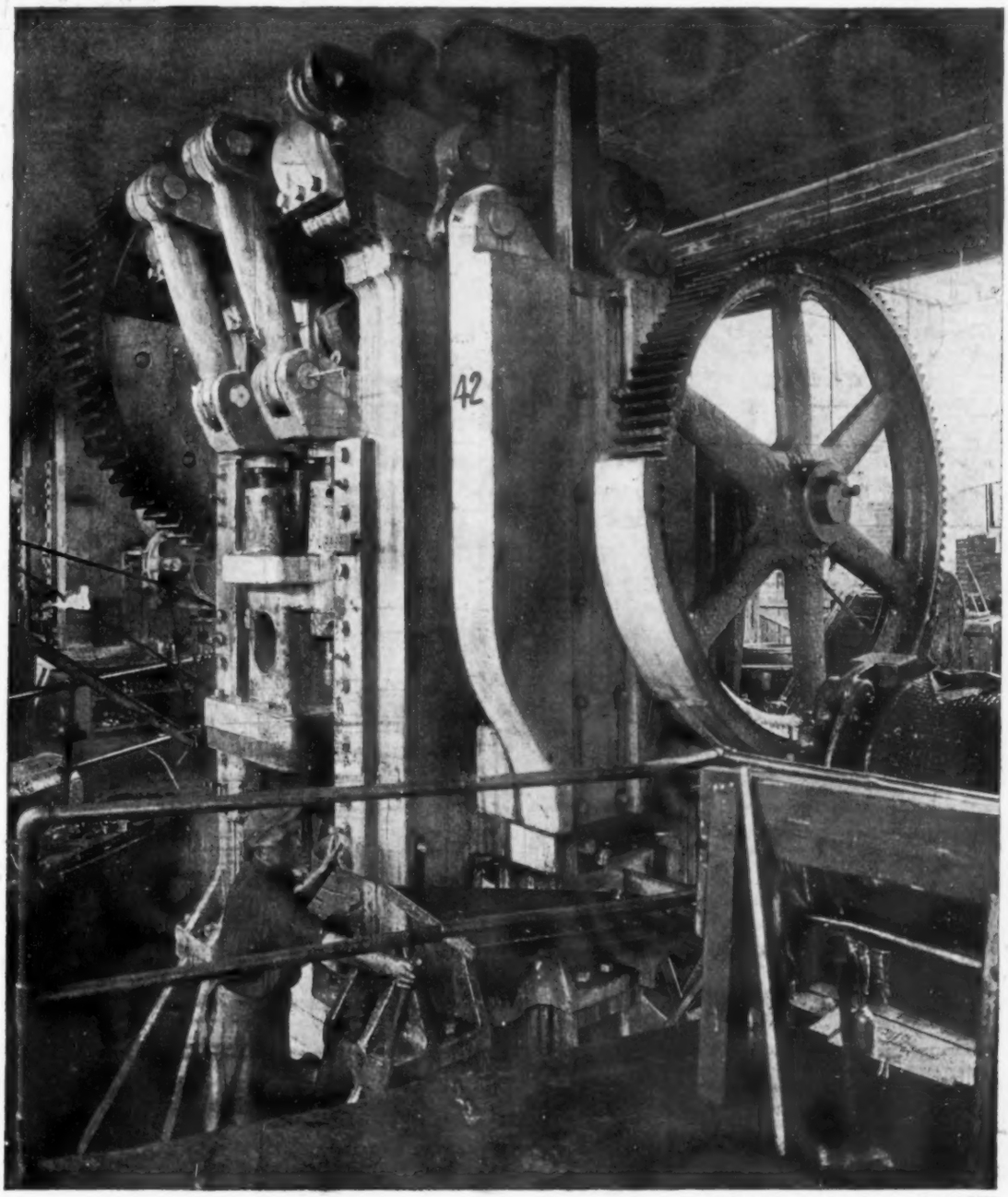


Photo by courtesy of our Customer

IN UTICA

"BLISS" No. 15-A Toggle Drawing Press—one of a number of large "BLISS" Presses operated by the Bossert Corporation. Another advertisement illustrated 12 other large "BLISS" Presses in this plant. Others, still larger, could not be properly illustrated. These pictures are part of the evidence that "BLISS" Power Presses hold the weight of *practical* opinion.

BLISS 1857

E. W. BLISS COMPANY

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FOREIGN SALES OFFICES *and* FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo St. Ouen

BLISS 1919

No. 72

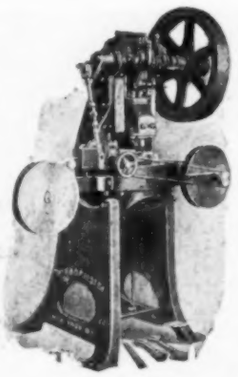
Automatic Feed Punch Presses

V & O Presses with automatic feed attachment will stamp out your small metal blanks at a rapid rate. They greatly reduce cost and labor.

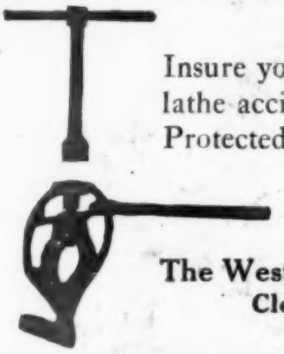
The stock and scrap rolls are made integral with the press. No wasted, cluttered up floor space.

Write for Bulletin A-6

The V & O Press Co.
Glendale, Brooklyn, N. Y.



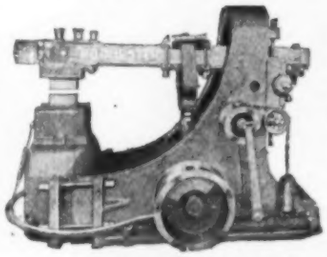
West's Protected Lathe Dog



Insure your workmen against lathe accidents—order West's Protected Lathe Dogs.

The West Steel Castings Co.
Cleveland, Ohio

This Is But One of Six Styles



This hammer is a hard worker, a profitable worker, like all the rest of its line.

One of the six will suit you.

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THE WEST TIRE SETTER CO.
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Randall & Stickney Indicators and Gauges

for every kind of precision measurements on duplicate parts. Quickly and easily applied. Unsurpassed in simplicity and durability.

Calibrated in thousandths of an inch or metric scale. Ideal for the rapid, accurate inspection of large quantities of work. No modern shop should be without them.

Write us today.

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Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.
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Trahern Circulating Pumps

have splendid wearing qualities and assure the right quantity of coolant, free from pulsations, to be applied at the will of the operator

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There is nothing to offset the saving when you invest in an Atlas Press. You get two presses for the cost of one when you install Atlas Presses. Write for the Atlas Bulletins.

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HUNDREDS OF SIZES AND STYLES

FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.

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STERLING

Sterling Grinding Wheels Are No Experiment

They Have Been On The Market For Over 29 Years.

The Sterling Grinding Wheel Company Tiffin, Ohio

There is nothing better than the Best

To secure 100% Economy and 100% Efficiency use W. N. Best oil and tar burners and furnaces for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc. Send for Catalog

"There is nothing better than the best"

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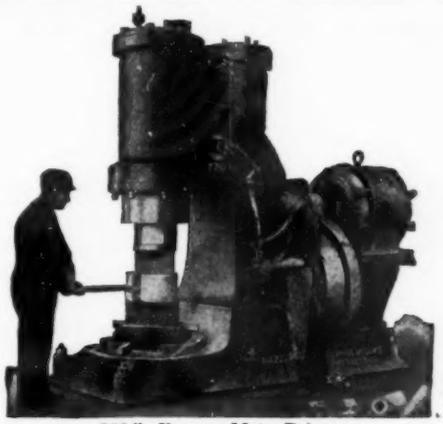
VELCO

V. E. Lapointe Mfg. Co.
Manchester, Conn.

Velco Service Means Reduced Broaching Cost to YOU

SEND BLUEPRINT FOR ESTIMATE



850 lb. Hammer Motor Driven

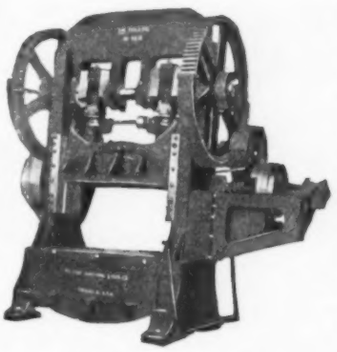
If it's a Nazel

You are sure of more power than it is possible to obtain with a spring hammer, more economy than it is possible to obtain with a steam hammer and greater efficiency than with either.

The Nazel Hammer is built in sizes from 75 to 850 lb. for belt or direct motor drive. Let us send you the Nazel Hammer book—it's mighty well worth having.

Nazel Engineering & Machine Works
4039 N. 5th Street Philadelphia, Pa.

THE "TOLEDO"
Double Crank Presses



The "Toledo" No. 95D.
For heavy drawing, forming and trimming.

distinguished by many admirable features which secure the utmost in economy with accuracy.

Heavy, well-balanced construction with specially designed crowns — hammer - forged shafts — massive, heavily reinforced connections—extra long slides with bevel gear adjustment.

Over 250 sizes for general sheet metal and drop-forged work.

"We fit the press to the needs"

The Toledo Machine & Tool Co.
Toledo, Ohio

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

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METALWOOD MANUFACTURING CO. DETROIT

Hydraulic and Hydro-Pneumatic Machinery

EXCLUSIVE SALES REPRESENTATIVES:
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Advantages Galore in the "LITTLE NIAGARA" Machine Tool Lubricant Pump

Never needs priming. It can't clog.
Needs no check valves. No sliding blades.
Gears never bother—hasn't any.
No springs and only one moving part—the rotor.
A "pep" pump that puts plenty of coolant right where it belongs.
Send for details today.

Patented August 18, 1918
Patented December 17, 1918

Hudson Pump Co., Inc.
Jersey City, N. J., U. S. A.

Alphabet and Figure Stamps

Note the sturdy shanks and short, stubby bevels—signifying strength

for
—better, cleaner work
—longer life
—satisfactory service under trying conditions
Mark your next order
"Pannier Bevel" Stamps

Catalog on request

PANNIER BROS. STAMP CO.
207-209 Sandusky St., N. S., Pittsburgh, Pa.

ERIE
Self Contained Tool Dressing Hammer

A hammer of acknowledged superiority in the production of light work. Automatic and double acting; no foundation required; either steam or air operation. Sizes 50 to 300 lb., inclusive.

Ask for Catalog "F"

ERIE FOUNDRY CO.
Erie, Pa.
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Confidence:

"Standard the World Over"

THE makers of THE "RACINE" High Speed Metal Cutting Machine extend to you the Compliments of the Season. They prophesy a year of prosperity for the mechanical industry, and they hope that you will receive your just share.

During the years that we have been in business, we have striven to produce a machine of strength, stability, and achievement. One upon which you can place confidence, the same confidence that we have placed in the industrial field.

We know and feel the demand for production. And from what we hear—from what we base our judgment and gauge the qualities of our product, we are pleased to say that THE "RACINE" High Speed Metal Cutting Machine is accomplishing its purpose.

The Racine Tool & Machine Company
1400 Jones Street, Racine, Wis., U. S. A.

Automatically Handles Your Stock

This Marvel No. 5 High-Speed Saw is equipped to automatically feed the stock to the machine. It makes a complete cut and is back in place for the next in from 10 to 15 seconds.

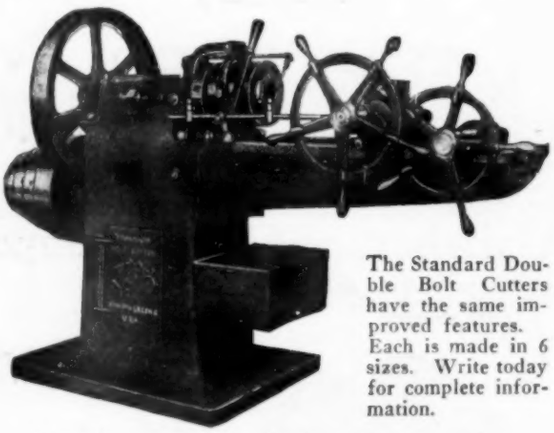
It is fast and economical. Write for its complete description.

Armstrong-Blum Mfg. Co.
347 N. Francisco Ave., Chicago, Ill.

Standard Bolt Cutters

The column and headstock of the Standard Single Bolt Cutter are cast in one piece, assuring perfect alignment and rigidity.

Our improved and absolute die control, the result of 20 years experience, is another important advantage of this machine. You can change the adjustment to cut over, under or exact size bolts in an instant while the machine is running if you desire.



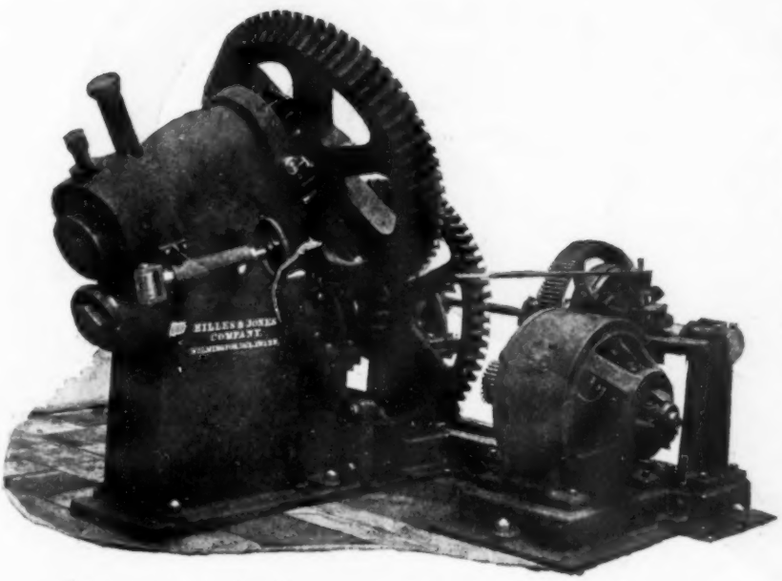
The Standard Double Bolt Cutters have the same improved features. Each is made in 6 sizes. Write today for complete information.

Six Sizes—1½ in., 2 in., 2½ in., 3 in., 3½ in., 4 in.

Circular gives details—write for it

Universal Machine Company
Pike St., Bowling Green, O.

Rotary Bevel Shears



H. & J. Rotary Bevel Shears are extensively used by boiler and tank makers and in all shops where plates are to be beveled for a caulking edge. They are especially valuable in beveling curved edges such as dome sheets, flanged heads and work having in and out curves.

Circular blades are used, rotating in opposite directions, made reversible so that two cutting edges are available. Cutter shafts are lined with bronze and the upper plate is fastened to the shaft by a flush fastening.

Hilles & Jones Company
Ninth and Locust Streets
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235 Oliver Bldg., Pittsburgh, Pa.
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One of the Hilles & Jones Metal Working Machines

SIMONDS

METAL SAWS

The SIMONDS Semi-high speed steel saw is especially recommended because it represents a steel vastly superior in cutting quality to the ordinary steel formerly used. This steel has been developed by exhaustive research and experiments in our own crucible mill.

The advantage gained by using Simonds Saw Steel is a cutting power which allows a longer run or faster feed.

The Simonds Inserted Tooth Metal Saw is recognized for its efficiency and economy. Many large plants are being equipped with this style of saw because of its proven superiority.

Write for prices.

SIMONDS MANUFACTURING COMPANY
"THE SAW MAKERS"
FITCHBURG, MASS.

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Thor ~the crane builder

Pneumatic Drills
Pneumatic Wood Boring Machines
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Chipping, Calking, Sealing and Flue-Beading Hammers
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Pneumatic Grinders
Pneumatic Hoists
Pneumatic Holder-On
Pneumatic Sand Rammers
Electric Grinders
Electric Drills

Send for the complete catalog of Thor tools.

Thor—the crane builder—is a Powerful, Efficient and Enduring long stroke riveting hammer in which "usual bothers" never appear.

Thors are troubleless and, therefore, capable of adding dollars of profit to the coffers of any concern using them.

These trouble-proof qualities are the result of the patented design of Thor Pneumatic Hammers. The handle, barrel and valve chambers are all in one solid piece of steel forging rather than being encased in the usual "three parts."

Thor construction absolutely provides against air leaks as well as the troublesome use of couplings, clamps, keys, locknuts and other complicated mechanisms.

Economical riveting is dependent upon efficient hammers. Every man who desires to accomplish riveting with economy had best think of Thor. Don't wait till you need pneumatic hammers before getting acquainted with Thor.

Make the acquaintance of this good tool today by looking over the new catalog.

INDEPENDENT PNEUMATIC TOOL COMPANY

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The

HIGLEY

Cold Metal Saw

Catalog will be sent on application to

Vandyck Churchill Company
93 Liberty Street, New York

No Crowding of Work Out of Shear

Nos. 3 and 4

The tendency to crowd work out of shear when cutting sheets is entirely eliminated by the draw-in cut of the

Hercules Shear

Another outstanding feature is the pressure over cutting point being obtained by a rolling contact. This greatly increases the power and means increased capacity. It also eliminates friction and insures freedom of operation.

Let us tell you all about Hercules Shears.

W. A. & C. F. Tucker
Hartford, Conn., U. S. A.

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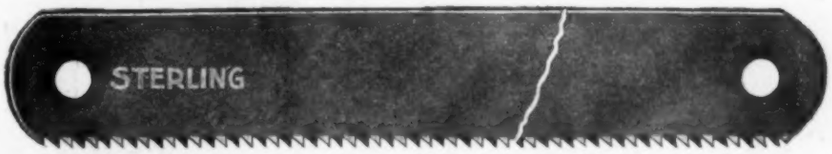
HACK STERLING SAWS

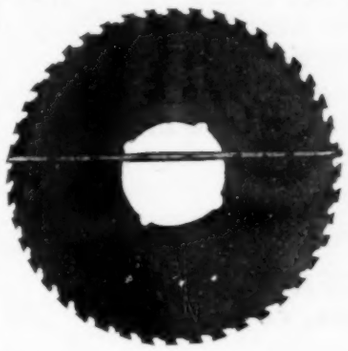


For the manufacturing of all metal products, both large and small, a Hack Saw Blade is almost a necessity. Many years have proven the "STERLING" Hack Saw Blade is one of real merit.

Manufactured by

DIAMOND SAW & STAMPING WORKS, Buffalo, N. Y., U. S. A.

Hunter Saws—Any Size, Any Style



What are your saw requirements?

Let us furnish estimates. Write

We manufacture—

Hot Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

Hunter Saw and Machine Co.
Pittsburgh, Pa.

Peerless HIGH SPEED

Has Proven Its Efficiency Where Others Have Failed

DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are today among the largest and best-satisfied users of our High-Speed Saws.

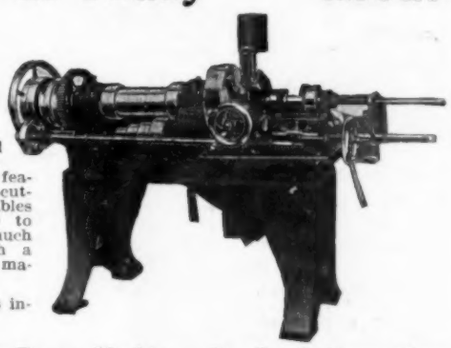
The "Peerless" is different—better. It does 50 to 100 per cent more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space.

What is your work? We can tell whether the "Peerless" will do it, and back our judgement with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE COMPANY
1615 Racine Street, Racine, Wisconsin

Write us Today about-

Hurlbut, Rogers



Cutting-Off and Centering Machines. Their feature of two cutting tools enables your operator to cut twice as much stock as with a single tool machine.

Our Catalog is interesting.

The Hurlbut, Rogers Machinery Co., So. Sudbury, Mass.

COCHRANE-BLY CO.

10-in. Compound Circular Table

A UNIVERSAL PROTRACTOR

With this device you can work from any number of centers at one setting of the work, such as required on Dies, Jigs, Templates, Cams, Etc.

Write for Circulars and Prices.

Cochrane-Bly Co.
Rochester, N. Y., U. S. A.

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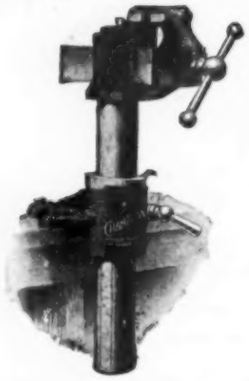
VICTOR SAW WORKS

SPRINGFIELD, MASS., U.S.A.

Champion Vises



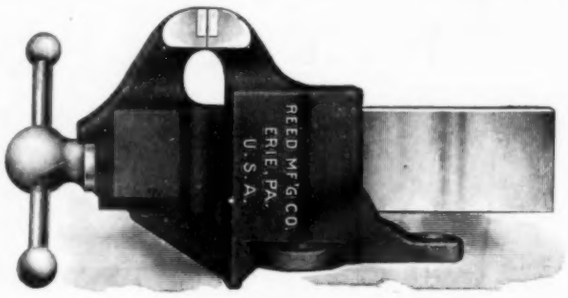
for Every Vise Use

There is a Champion Vise for every possible use a vise could be put to. The Champion is made in many different sizes and styles so that you may always get a Champion for just your work.

Our big tool catalogue describes all the different types. It is well worth having—*send for it today.*

Write for our interesting 100-page catalogue.

Western Tool & Mfg. Company
Springfield, Ohio



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Reed Vises do not break. They are many, many years wearing out. They give satisfactory service all the while.

Thousands of users will testify to their superiority. Those who know most about vises prefer Reed because they are the best obtainable.

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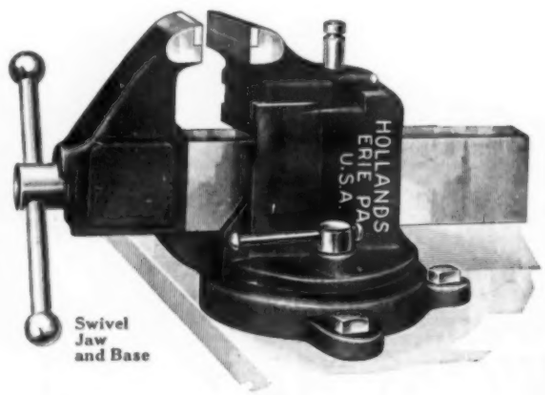

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Over thirty years' experience goes into every Hollands' Vise made. They are strong, easy of action and mechanically correct. You will find a Hollands' Vise for every Vise use.

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For Turret Machines
Adjustable to knurl all work up to 2½-in. diameter.

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Three Sizes

DRILL VISE

Three Sizes
With and Without Jig Attachments
Often used on miller, shaper or planer.

Send for circulars.

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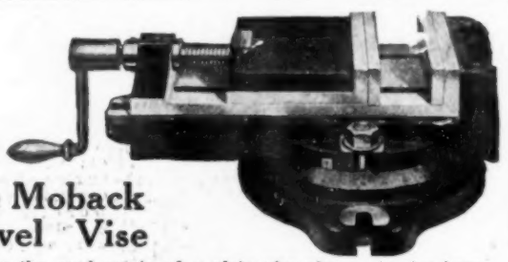
Providence, R. I.

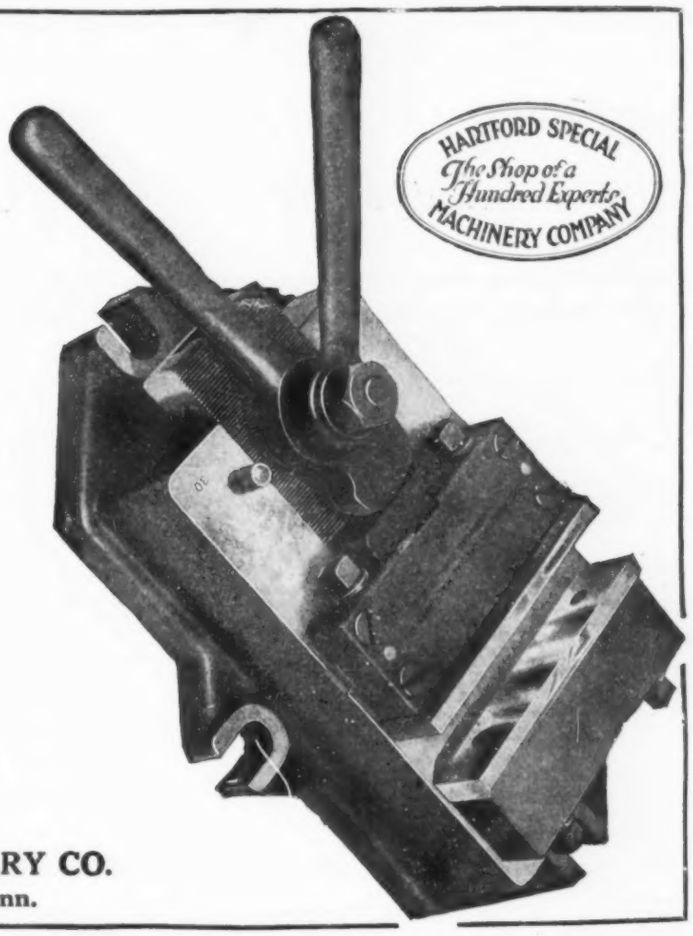


The Moback Swivel Vise

combines the good points of a plain vise plus a circular base graduated in degrees. The vise can be taken off the base and used plain if desired. Also has cross-slots and side ears, and the jaws are hardened and ground. Sizes 4 to 8 in. **Let us send particulars.**

Moback Tool & Machine Mfg. Company
330 Atlantic Ave., Boston, Mass.
Foreign Agents—Alfred Herbert, Ltd., Coventry, England; Milan, Italy; Yokohama, Japan; and Calcutta, India

Built for Strength and Economy



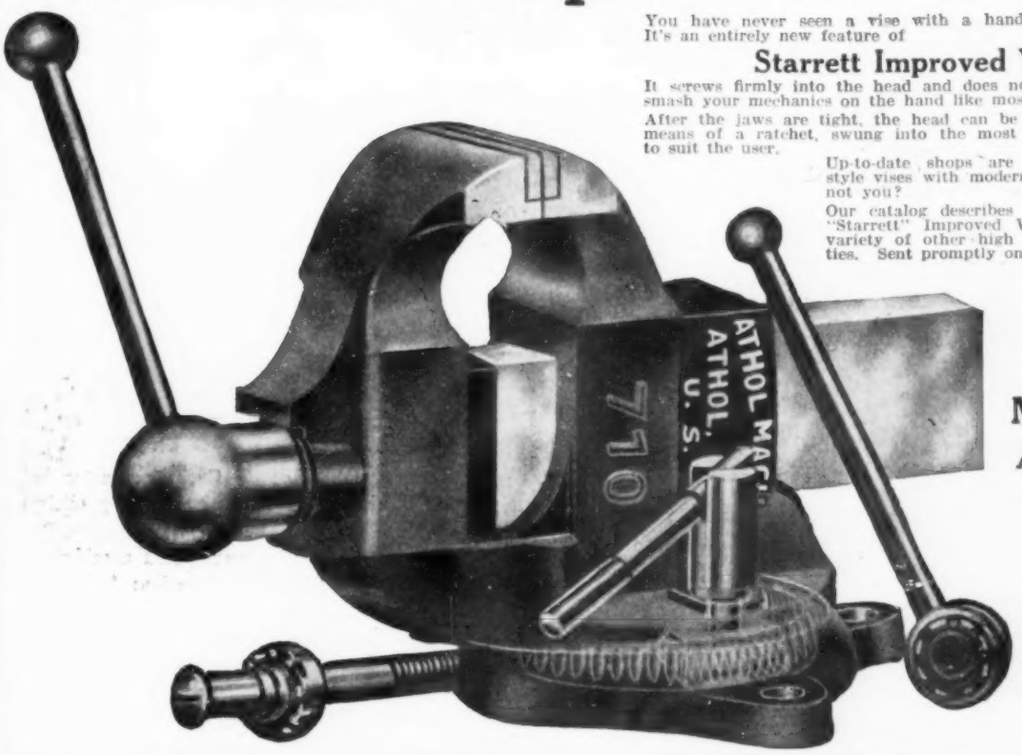
A vise you can depend upon. Every part, except the base, is made from hardened steel, the working parts are drop-forged and all surfaces are ground. It has the strength necessary to stand the heavy strain of milling work day after day and last a long time.

It is economical, due to its long life. The grip is firm and positive and it can be adjusted in a few seconds.

Get our descriptive matter on these new vises. It will prove of interest to you.

THE HARTFORD SPECIAL MACHINERY CO.
280 Homestead Avenue, Hartford, Conn.

Note the Improved Handle



You have never seen a vise with a handle like this before. It's an entirely new feature of

Starrett Improved Vise

It screws firmly into the head and does not slip through and smash your mechanics on the hand like most vises.

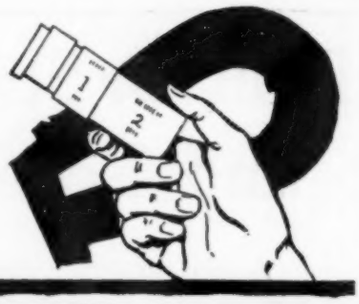
After the jaws are tight, the head can be pulled out and, by means of a ratchet, swung into the most convenient position to suit the user.

Up-to-date shops are fast replacing old style vises with modern "Starretts." Why not you?

Our catalog describes a complete line of "Starrett" Improved Vises, as well as a variety of other high grade shop necessities. Sent promptly on request.

Athol Mach. Co.
Athol, Mass. U. S. A.

How the National Cash Register Company Uses Johansson Blocks in Locating Holes of Master Plate

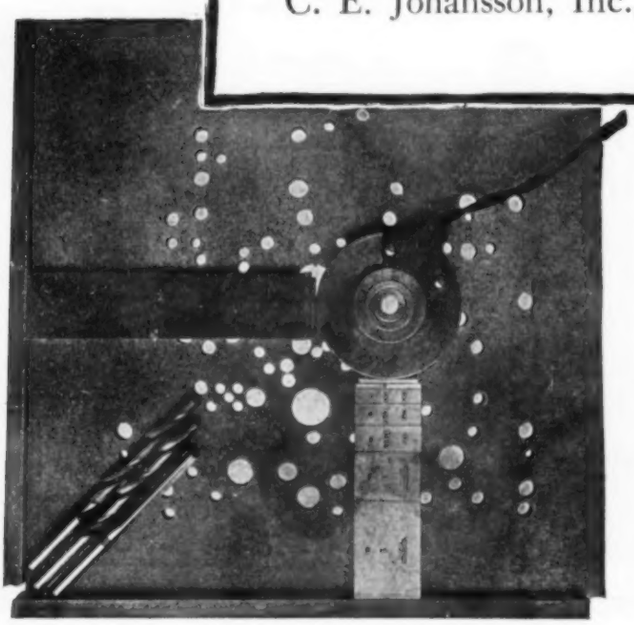


BETTER methods are usually the result of some simple idea—so simple often that when it is put into use men wonder that the improved method had not been thought of long before.

The use of Jo
ing tools in the l
plate is not new.
pany, of Dayton,
ingenious and tim
stead of the butt
maintaining the
tration on this pa

The locater, wh
as a "magnetic ch
veying alternatin
direct current is
it firmly while th
other current to
bored and the loc
is so constructed
outer diameter, a
current is turned
of work for sever
the magnetizing.
Robert Blair, of I

The plate to
with two strips of



be absolutely at right angles. The diameter of the locater being known, combinations of Johansson Blocks are made up equalling the required distance from the edge of the locater to the horizontal and perpendicular

ely a large but-
ings is held se-
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ed and reamed

National Cash

ne man is able
or four holes
our plant. In
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we are not de-
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MILLIMETER
gages of unusual
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al man who has
e so smooth that
ing colors. An ordinary finish looks crude in comparison. Few organizations have need for a set of gages made to such a high standard of accuracy, but that they can be made, when required, is just another demonstration of the possibilities of the Johansson processes.

This is Page 2 of Issue 1 of the Johansson Journal

As is set forth in the first issue, the Johansson Journal is established as a publication or bulletin devoted to better gaging methods. It will be published only as we gather and prepare descriptions of the most helpful methods in use by toolmakers, shop men and inspectors. Contributions are invited and paid for promptly.

If you are not on our mailing list, send for a copy of the first issue, mailed free of charge to any one interested in toolmaking, the limit system, gaging practice, etc.

C. E. Johansson, Inc., Poughkeepsie, New York

MAKE YOUR STANDARD KNOWN

When you check with Johansson Gages, put a tag on your products, setting forth that fact. It gives a publicity that may be very useful.

During the latter days of the war period a midwest plant had a tool returned with the brief notation: "This is oversize on 2.835 - 2.836 dim. Repair at your expense". Fortunately the manufacturer used Johansson Gages and was able to know that this size was within the tolerance limit. He simply marked on the ticket: "This size is correct—checked with Johansson Gages". There was no further argument. Ask for a specimen of a tag that you can use to advantage on output that is checked with Johansson standards.

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We never reach heights above our habitual thinking. It is the atmosphere we create for ourselves in thought that permeates and perfects what we do. The knowledge born of long experience that our product is the high speed steel par excellence fills the atmosphere of our plant with an ideal that every operative breathes. "Red Cut *is* the best and, therefore, it ***shall*** be the best" is the driving force that makes.

"Red Cut Superior"

THE NATIONALLY KNOWN—FIRST QUALITY

HIGH SPEED STEEL

THE BEST FOR ALL MACHINE WORK

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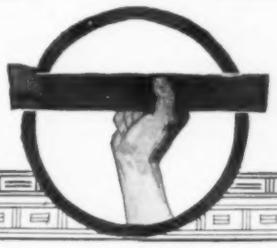
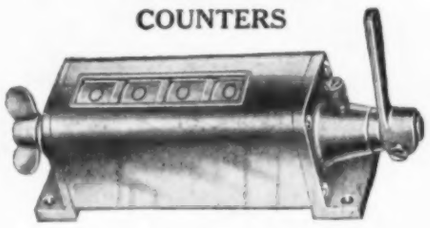


Getting It Back

Giving shorter hours and longer wages brings up imminent questions of getting some of it back—as by increasing production thru checking it up, and *standardizing* machine-output with

Veeder
COUNTERS



This Set-Back Rotary Ratchet Counter records the output of punch presses, metal-stamping machines and others, where a reciprocating movement indicates an operation. Sets back to zero from any figure by turning knob once round.

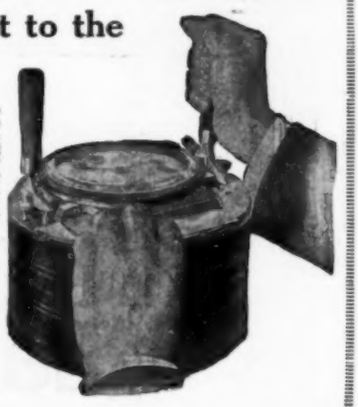
Send for the counter booklet

The Veeder Mfg. Co.

15 Sargeant St., Hartford, Conn.

Don't Leave It to the Men

So-called systems which allow the workman to keep his own time distribution are useless. The Calculagraph keeps an accurate record of *all* time, on any number of operations. There is no guessing nor juggling—actual figures that are correct. Put the Calculagraph on your payroll and see how quickly it will pay for itself.

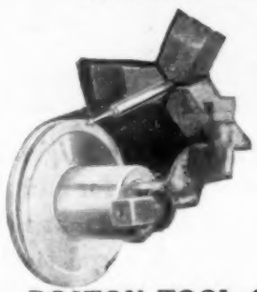


Ask for our booklet "Elapsed Time Records"

The Calculagraph Company

Dept. 38
30 Church St., N. Y. C.

Find True Spindle Center
By Using The Boston Wiggler



Here's a new Positioning Indicator for finding the true spindle center on Milling Machines, Drill Presses and Lathes.

It will speed the work of "Laying Out" positions for holes, surfaces, etc., on jigs, fixtures and other kinds of work.

It does not matter how badly the chuck runs out for the point of the ball on this "wiggler" is made to run true instantly.

Investigate today!

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Shop Agents Wanted — This will be a money-maker for you.

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WITH THE
Etchograph
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An electric machine for marking tools and metal articles for identification purposes, etc. Requires no acid—uses only electricity—lasts indefinitely.

Write us today for literature and state current available.

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Heavy and Light Roller Bearings
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Ball Thrust Bearings

For All Purposes

Only the Highest Grades of Alloy Steels Used

The Graham Roller Bearing Co.

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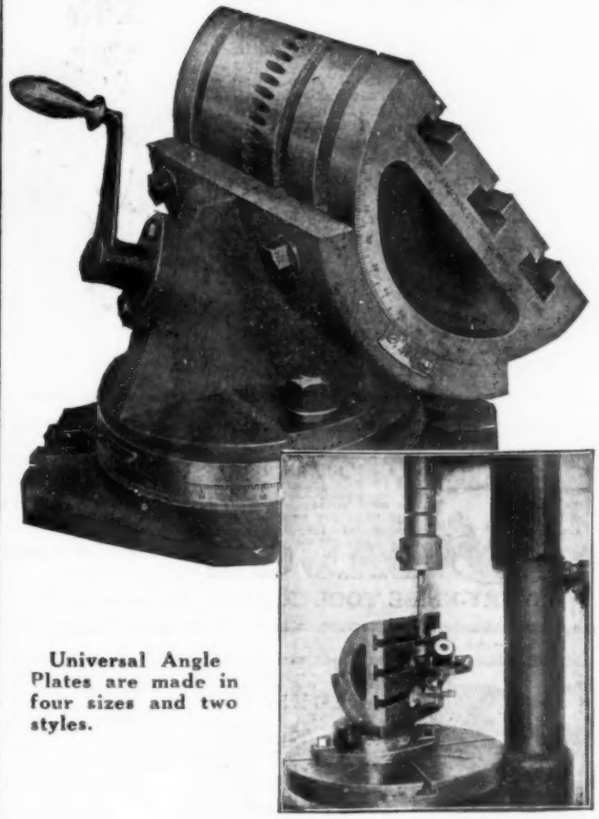

Universal Angle Plates are made in four sizes and two styles.

Universal Angle Plates

Do away with inaccurate make-shifts—

Displace your inaccurate make-shift rigs with Universal Angle Plates, the modern tool room necessities, that take at least a dollar an hour off your labor and overhead costs. The work can be held on any angle with this device; thus much time is saved by eliminating extra setting-up when it is necessary to perform the same operation several times on one price at various angles, such as drilling, etc.

Universal Angle Plates have a motion through 360 degrees horizontally and 90 degrees vertically. They are a source of profit wherever used in connection with lathes, milling machines, drill presses, shapers, grinders, planers, and die sinking machines.

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100 Ruggles Street, Boston, Mass.

Agents for Great Britain, Belgium, Italy, India, Burmah and Ceylon, Japan, Formosa and Korea: Alfred Herbert, Ltd., Coventry, England.

Tycos

TEMPERATURE INSTRUMENTS

Indicating Recording Controlling

This General Trade Mark

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covers all indicating, recording and controlling instruments made by this company and is a synonym for standard apparatus—precision, reliability and permanence.

We invite, from all interested industrial managers, correspondence relating to our instruments and their uses.

Our stock models cover every usual industrial requirement, with very moderate outlay.

Taylor Instrument Companies

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There's a Tycos or Taylor Thermometer for Every Purpose

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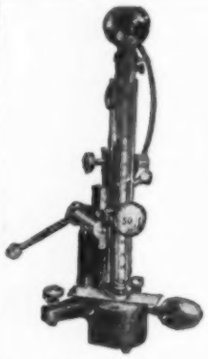

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International Standard
(Hardness Tester)

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is now done almost exclusively with
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DIRECT READING, can be operated by anyone with rapidity; measures softest metals and hardest steels without adjustment. Is the only instrument that properly agrees with others of its kind, and is used for ordering material to specification. Send for our booklet, free.

The Pyroscope

is the common-sense heat measuring instrument that makes straight for results, without fuss. It costs least of all, burns simple kerosene, never varies. It is the available trusty in the grimy hands of furnaceman, hardeners and carburizers. It is a pet in the laboratory, and preferred by colleges. Interesting bulletin free.

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Temperature

IT NEVER FAILS

to give absolutely accurate readings on any of the flat or cylindrical parts you manufacture. An unskilled operator cannot go wrong with the

American Amplifying Gauge

In the manufacture of pistons, piston rings, thickness, wrist pins, cam rolls, bushings, etc., this instrument is indispensable in your testing room. Send for Bulletin "A" and learn all its features.

American Gauge Co.
Dayton, Ohio

SYRACUSE GAUGES
ONE POSITIVE SEALING POINT

Two and Three Pin Micrometer and Snap Gauges.

Special Gauges to order.

LOWRY-KNISE TOOL CO., INC., Syracuse, N. Y.

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Our Dividing Head will make your Hand Miller a Universal Machine. It will reduce your cost on small milling work and save time.

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Jones Tachometers for all Uses
Hand (Portable) Tachometers
Stationary Tachometers

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MILFORD

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Sample sent on request.

The HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

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Opened.

TUCKER

The Quality Oil Hole Covers

Positive protection to bearings—Worthy of the best machines—because they are right in material and design. Made to meet every requirement.

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Style A.

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Style D.

Style E.

Style F. Drive.

Style G

W.A.&C.F. TUCKER, Hartford, Conn., U.S.A.

FOREIGN AGENTS: Fenwick Freres & Co., Paris, France
C. W. Burton, Griffiths & Co., London, Eng.

Get a Free Sample

W & B **MINOLARD** Co.

Write in for a free sample quantity of Minolard, the universal Cutting Oil. A trial will prove its value. Just send us a postal today for the *free trial quantity.*

The White & Bagley Co., Worcester, Mass., U. S. A.

G&B EVIDENCE

This Battery of Gilbert & Barker

T-5 Self-Measuring Extension Pumps

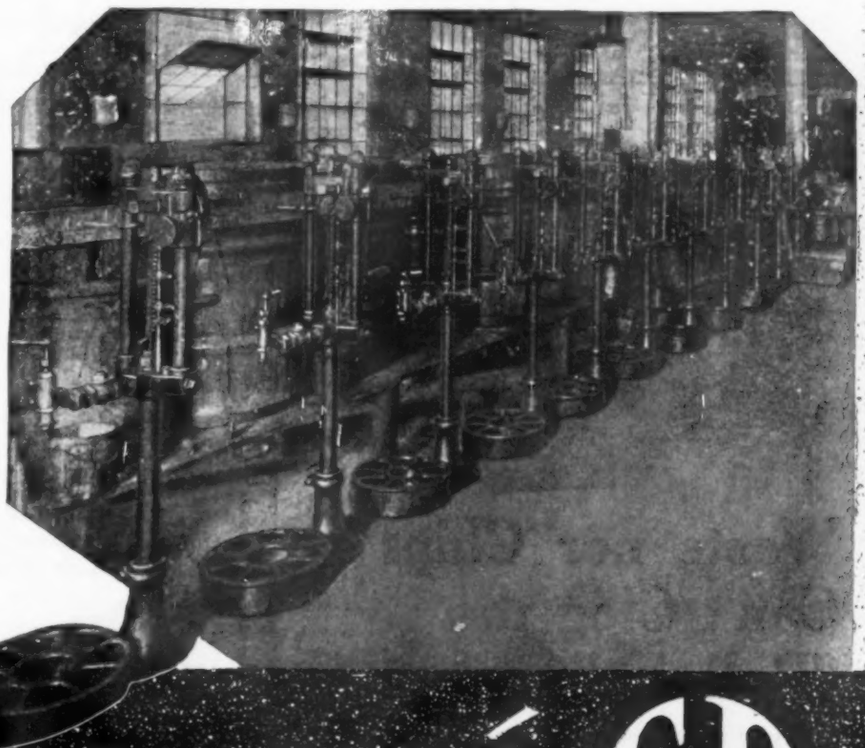
with tanks located several floors below is giving splendid service at the plant of

Hirshberg-Hollander Co.

large paint manufacturers of Baltimore, Md.

The tanks are leak-proof, dirt-proof, dust-proof and evaporation-proof. The pumps accurately measure gallons, half-gallons, quarts and pints.

You can put your oil handling problems on the same efficient basis as this progressive concern.



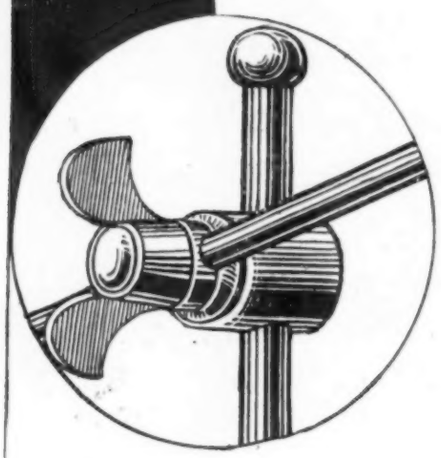
We'll give full details promptly, cheerfully and without obligation. Just ask for Bulletin 42.

Gilbert & Barker Mfg. Co.
10 Union St.
Springfield, Mass.
U. S. A.

Established 1865 G&B

ANYANGL
LIGHTING FIXTURE

Spots the light rays where the workers need them.



A NEW lighting fixture, instantly adjustable to any position, designed to meet the present-day demand for an adequate lighting fixture for use in office, shop, and on machine tools.

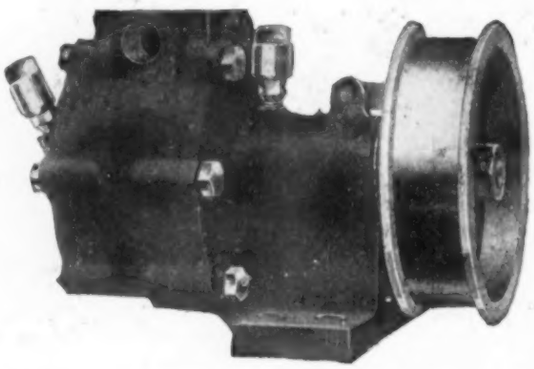
Everywhere in your plant where concentrated light is necessary or where better light means better work, you can use with profit "Anyangl" Lighting Fixtures.

Details of "Anyangl" Fixtures are in our booklet. May we send you a copy?

Let There Be Light—Where Needed.

Please mention this Periodical

Miller Saw-Trimmer Co.
Pittsburgh, Pa.



Waste nor Chips Can't Clog the "Rollway"

Save your temper and tools by installing the ever-efficient "Rollway." It is the Prince of Pumpdom for cutting compounds and force feed lubricating. On high or low speeds it operates efficiently and you can place it in any position on the machine. Primes itself on a 5 ft. suction and never clogs on waste or chips. Don't purchase a pump until you have seen our catalog. You will then order a Rollway.

MICHIGAN MACHINE CO.
58 Porter Street, Detroit, Mich.

Self-Closing

thus preventing dust and grit scoring your bearing surface. This is the protective feature of the

Bennett Oil Hole Cover

It is economical in cost and convenient in use. Simplicity of application adapts them to your product—merely drill a hole in the bearing and force the case in position.

It is neat in appearance and does not project enough to hinder proper cleaning.

Full description of our complete line is yours if you ask for Catalog M.

Bay State Stamping Co.
380 Chandler Street, Worcester, Mass.

4 Reasons Why

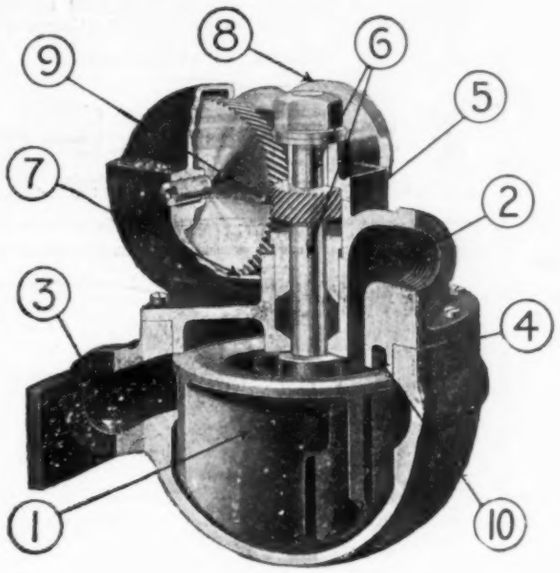
you should use a "Woodstock" Improved Safety Tapping Chuck. 1st. Practically impossible to break a tap no matter how tough the operation.

2nd. They will work to full length of the tap or where threads are only one or two deep. 3rd. Made with or without Automatic Reversible Attachment. 4th. Sent on 30 days' free trial. New illustrated descriptive literature absolutely free and no obligation incurred.

PETER BROS. MFG. CO.
ALGONQUIN ILLINOIS

Messrs. A. A. Jones & Shipman, of Leicester, England, L'Outillage Mecanique, 16 Rue Dupont, De L'Eure, Paris, France, carry a complete line of these chucks.

Volyum



The Volyum coolant pump is giving splendid service in many of the largest plants of the United States—adding to the sum total of production an amount equal to the loss formerly traceable to the less efficient pumps—due either to pump troubles or the lack of a proper volume of coolant.

Ten points of exceptional design are shown in the booklet—"Full Facts."

Send for it

The Volyum Pump Co.
421 W. Liberty St., Cincinnati, Ohio

This attachment enables you to cut oil grooves in tapered bearings

We have designed and are now manufacturing a special Relieving and Taper Attachment for use on Fischer Oil Grooving Machines. It can easily be applied as shown in the illustration and enables you to cut grooves either straight or taper in the form of a cross, in a straight line in the direction of the length of the shaft or bushing, in form of a half circle around the shaft or bushing, in the form of a helix of right or left hand, with length of approximately one-half, one or two revolutions and various other forms and combinations.

This attachment enables you to cut a wide range of oil grooves as well as increases the economy of your Fischer Oil Grooves.

May we send our descriptive circular?

Fischer Machine Company
310-316 No. Eleventh St., Philadelphia, Pa.

Chas. A. Strelinger Co., Detroit, Mich. Foreign Agents: Coats Machine Tool Co., Ltd., London, Glasgow and Newcastle-on-Tyne. Aux Forges de Vulcain, Paris, France. Yamatake & Co., Tokyo, Japan. Henry Coe & Clerici, Milan, Italy. Allied Machinery Co. of America, 120 Broadway, New York, for Switzerland, Spain and Portugal. Ateliers Demoor, Brussels. Chr. A. Herstad, Norway, Sweden, Denmark and Finland.

The above are samples of oil grooves cut with this attachment on a Fischer Oil Grooving Machine.

A Moisture-Proof Finish,

The Best Rust Insurance

"Poorly protected at the surface"—that is the one serious defect of many products otherwise faultless in construction and workmanship—neglected at the very point where rust and rot begin, where moisture is ever ready to attack, the surface.

HILO

Varnishes, Enamels and Japans

Hilo Varnishes, Enamels and Japans are moisture proof and wear resistant; they are made to save the surface. A few suggestions are:

Oilproof Machinery Finishes in colors,
White Enamel for food machinery and sanitary equipment,
Black Japans for automobile and office equipment,
Colored Enamels for steel furniture, factory lockers and shelving,
Varnishes for wooden furniture.

You can obtain the best finishes for your products by consulting one of the Hilo Service Salesmen. These men are trained in the *why* and *how* of finishing. On request one of these men will call promptly. His services put you under no obligation.

Hilo Varnish Corporation

Formerly Moller & Schumann Co.

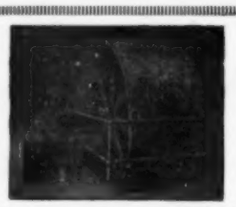
1 Gerry St., Brooklyn, N. Y. Chicago, Ill.

Pacific Coast Distributors:
The Brininstool Co., Los Angeles, Cal.

EMPRESS
OIL AND GREASE CUPS
Bowen Products Corporation, Auburn Division
Successor to Bowen Manufacturing Company
AUBURN, N. Y.
Catalog "H" on Application

30 in. 24 yd. rolls, $12.00
36 in. 24 yd. rolls, 13.00
42 in. 24 yd. rolls, 16.00

We now have manufactured especially for us a tracing cloth that will compare favorably with any in the market. The surface is of the best. It takes ink perfectly. It is tough. Its transparency is high. Its erasing qualities equal any. And the Price!
Get our prices on cut sheets, printed with border and title. *Send for sample.*
SPAULDING-MOSS COMPANY
34 Federal St., Boston, Mass.



Belt Users Book Free
To help you get the most from your belts. It contains valuable information.
Write for a copy gratis.
J. E. RHOADS & SONS
Makers of Rhoads Leather Belts
PHILADELPHIA.....33 N. Third St.
NEW YORK.....123 Beekman St.
CHICAGO.....343 W. Randolph St.
Factory and Tannery: Wilmington, Del.

New oil from old oil——
New waste from waste waste
no more than a trace of oil remains in oily-chips after passing through this machine. Same is true of waste. The reclamation in both cases is the limit of mechanical possibilities. ¶ Centrifugal; direct steam turbine drive. Quadruple capacity of belt driven machines. Quicker, better; more easily charged and discharged; less driving power; longer life. Every possible feature for ease in handling. **Write for full data.**

Savoil Separators

Oil & Waste Saving Mach. Co. Real Estate Trust Bldg., Phila., Pa.

Ransom Speed Controller

Automatically takes care of the overspeeding problem. Gives perfect control with speed variation up to 75-100%. Cannot possibly fail as long as the motor runs.

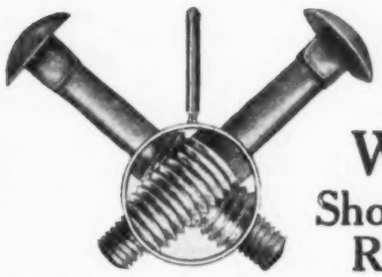
Ransom Mfg. Co., Oshkosh, Wis.

Highest Efficiency—Utmost Economy

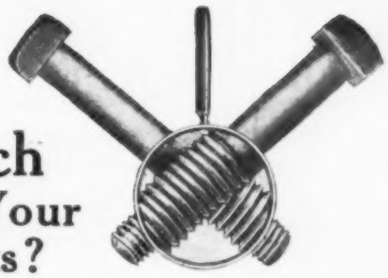
"Hole Hog" Multiple Drillers and Borers increase the output and reduce production costs. Save in every direction. Increase the capacity of your plant by using "Hole Hogs" instead of building an addition. Tell us your needs.

MOLINE TOOL COMPANY - Moline, Illinois

Magic SOLUBLE OIL



Which Shows Your Results?



Compare the threads on the bolts shown in these two actual photographs. Those—on the left—were made on a machine using a well-known cutting oil with a mixture of 4 lb. Soda Ash to 16 parts water and 1 part oil. The die ran only 27 hours. The threads are ragged and rough.

The photograph on the right shows threads made on the same machine using Magic Soluble Oil with a mixture of 24 parts water to one of oil. (The die ran 90 hours.) These threads are smooth and even.

Magic Soluble Oil is daily proving in hundreds of representative shops that it improves and increases factory outputs. Barrel sent on approval.

Fiske Bros. Refining Company, 24 State St., N. Y. City

Manufacturers of the Well-Known

MAGIC CUTTING COMPOUND and CLIMAX MINERAL LARD OIL

Factories: Newark, N. J., Toledo, Ohio Branches in Large Cities

Style "C"

Style "O"

THE HINGE

Style "G"

Style "Y"

Style "B"

Style "L"

Style "T"

Style "H"

GITS OIL CUPS

Give perfect satisfaction where others fail. State style and size in which you are interested, and we will send free samples and catalog.

Gits Bros. Mfg. Co.

1940 S. Kilbourne Ave., Chicago

OAKITE CLEANS

Our business is to solve your cleaning problem Put it up to us!

OAKLEY CHEMICAL CO

24 THAMES STREET NEW YORK

CONUS OIL CUPS

for All Purposes

Simple—Efficient—Economical

Made of a high-grade Swedish steel. Their serviceability and quality outbalance their cost. The leading manufacturers, both in this country and abroad recommend them.

"Conus means no tapping"

Ask for Samples and Circulars Nos. 1 and 2

A. B. GALCO, Ltd., *Sole Distributors*

8 West 40th Street, New York City

Send For The Gem Catalog

Every shop foreman and worker should know about "Gem" Cost Reducers.

Then, when work piles up, suggest the "Gem" because the "Gem" eases up things in a wonderful way. Send for your copy now.

Gem Manufacturing Company

Goebel and Fulton Sts., N. S. Pittsburgh, Pa.

English Agents—A. A. Jones & Shipman, New Century Works, Leicester, England.

KEYSTONE OF GEM GUARANTEE GOOD QUALITY TRADE MARK

Brubaker Bulletins

being a series of quality features— each ably upholding Brubaker repute

they never "hog" nor tear

It is highly important that staybolt holes should be tapped clean. Torn threads are weakened and leaks have been caused thereby. The special method of relief employed in the manufacture of

Brubaker

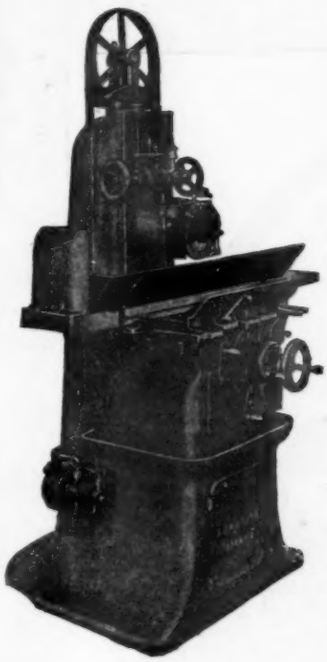
Special Tempered Relieved

Staybolt Taps

assures a clean shearing cut. These taps not only cut clean but they cut over longer periods; they also cut at greatly increased speeds. All these features are due to Brubaker temper which practically insures them against fracture. A Brubaker will give you a full 20% more holes and every hole will be of uniform size. You have much to gain by using these taps—send for information and see why.

The Tap with the "Continuous Tap".
A method by which you can't tell where the taper thread enters the straight thread, thereby producing a uniform cutting edge which distributes the work.

W.L. Brubaker & Bros.
50 Church St., New York.



The Wet Grinding Attachment

of the

ABRASIVE

entirely eliminates all danger of the work becoming heated through the action of the wheel and permits a sure, rapid production.

Get all the particulars about it and the Abrasive Surface Grinder

Abrasive Machine Tool Co.

F. N. MacLeod, President and General Manager
East Providence, R. I., U. S. A.

FOREIGN AGENCIES: Aux Forges de Vulcain, France. Bevan & Edwards Pty., Ltd., Australia. Burton, Griffiths & Co., Great Britain. J. Lambercier & Company, Switzerland. Selson Engineering Company, Italy; Wilh. Sonesson & Company, Sweden; A. R. Williams Machinery Co., Canada.

Titeflex ALL-METAL **TUBING**

REG. U. S. PAT. OFF.

Write for literature

For gasoline, oil, air, etc. Extremely flexible, permanently tight. No packing to wear out or disintegrate; delivers a clean fluid. Absorbs vibration; will not crystallize and break. Any lengths and couplings. Easy to install.

Titeflex Metal Hose Corporation
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471 Bourse Bldg. Philadelphia — 1421 Ford Bldg., Detroit — 550 McCormick Bldg., Chicago

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LADEW "TURTLE" LEATHER BELTING

Waterproof Oilproof Timeproof

EDW. R. LADEW CO. INC.

GLEN COVE, NEW YORK, U.S.A.

Trade READING C AND B Mark
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Clark Flexible Couplings Satisfy

No misalignments, no friction. Strong, durable and economical. Just the thing. And they are simpler and stronger than rigid couplings and flexible at all times.

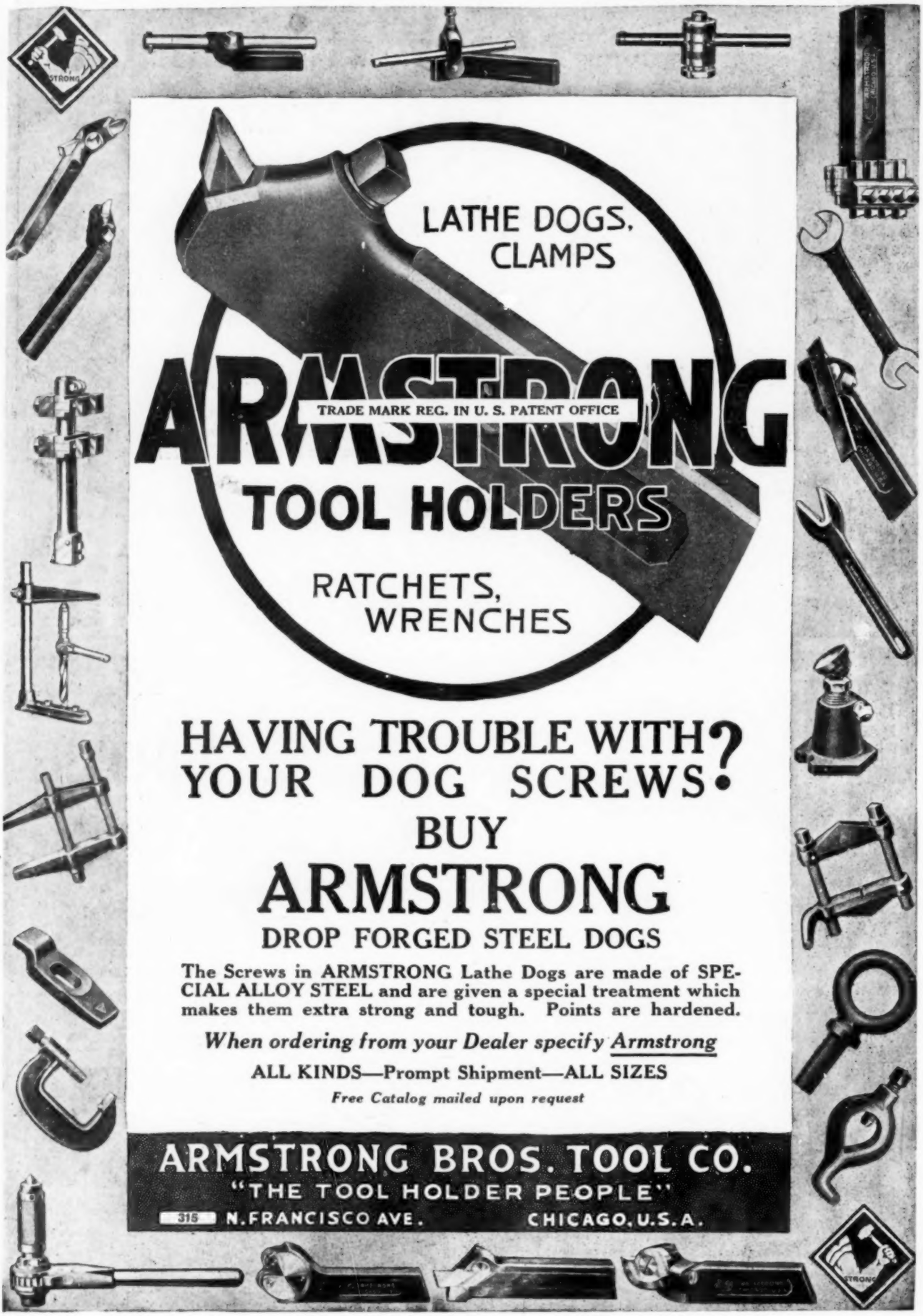
Act now—send for catalog. It is convincing.

I. H. DEXTER CO., Inc.
Flexible Couplings
Walker and Church Sts. New York
Darling Bros., Ltd., Montreal, Que., Canada

The Jackson Belt Lacing Machine

saves its cost every few months. It's light and portable and produces a joint in three minutes that will stand a tensile strength of 1900 lbs. With it one man can do in three minutes at a cost for material of one cent, what usually requires a half hour of two men's time and 10 to 12 cents worth of rawhide the old way. **Write for the "Jackson Book."**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Penn.



HAVING TROUBLE WITH?
YOUR DOG SCREWS?

BUY

ARMSTRONG

DROP FORGED STEEL DOGS

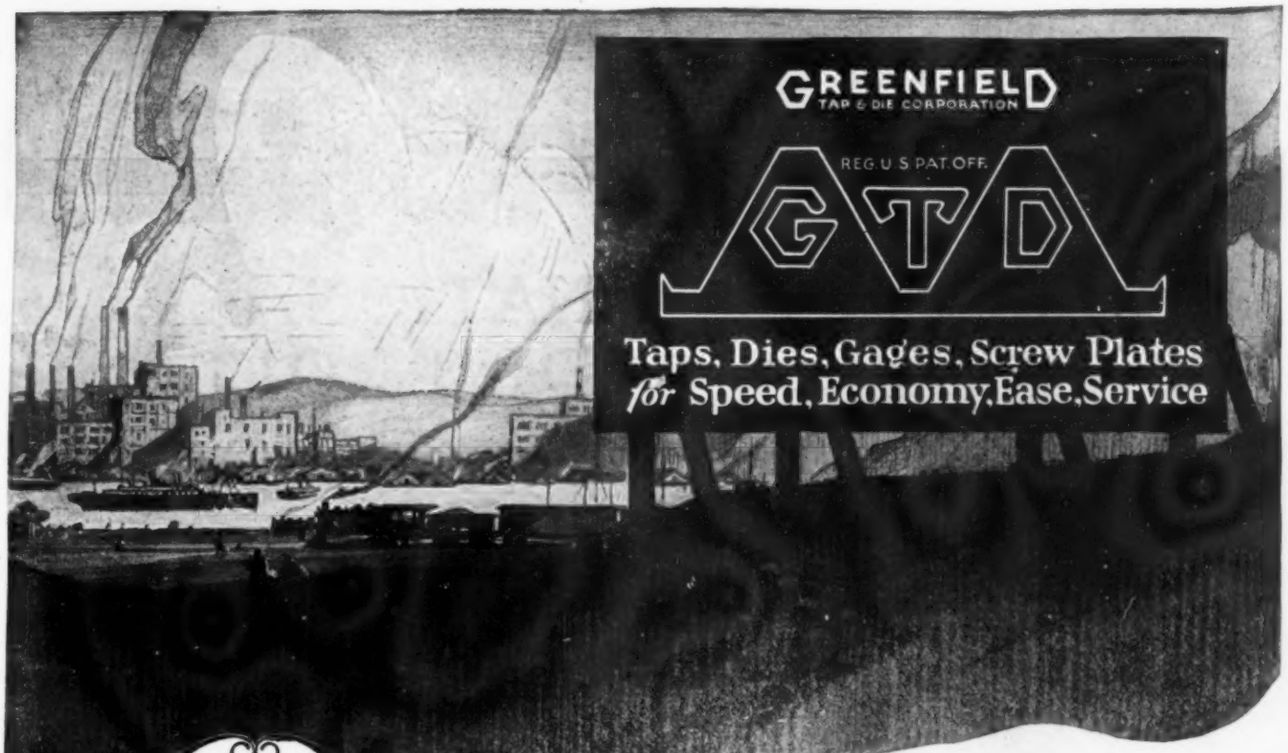
The Screws in ARMSTRONG Lathe Dogs are made of SPECIAL ALLOY STEEL and are given a special treatment which makes them extra strong and tough. Points are hardened.

When ordering from your Dealer specify Armstrong

ALL KINDS—Prompt Shipment—ALL SIZES

Free Catalog mailed upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
316 N. FRANCISCO AVE. CHICAGO, U.S.A.



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PRODUCTS
Taps and Dies
Screw Plates
Reamers
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Pipe Tools
Opening Die Heads
Machine Tools
Threading Machines
Lathes & Screw Machines
Grinding Machines
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Whenever you need screw-cutting tools remember this trade-mark

GTD

GREENFIELD
TAP & DIE CORPORATION
Greenfield, Massachusetts, U.S.A.
Canadian Plant; Wells Bros. Co. of Canada, Ltd., Galt, Ontario

Our catalog, No. 40 (Pocket Size), shows pictures of all types of taps, dies, reamers, screw-plate sets, etc., for machine manufacture and repair work. A glance through it will enable you to choose the tool best suited to your needs.
Order this catalog today—use the coupon.

G T D
Corporation
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Please send your pocket catalog, No. 40, on taps, dies, screw-plate sets, reamers, etc., with 50 pages of useful information for the machine-shop workman.

Name of Person.....

Name of Shop.....

Address .....

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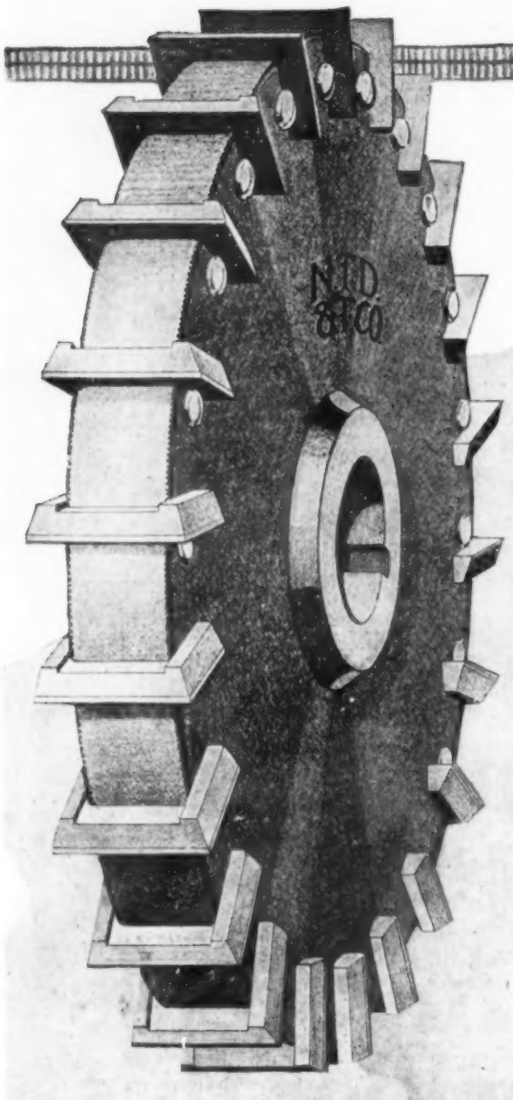


NATIONAL DETROIT

A Trade Name and an Institution

When a ***trade name*** stands for results obtained from grouping together all the manufacturing facilities of an industry, this ***name*** is as much an ***institution*** as the buildings which stand behind it.

When NATIONAL DETROIT appears on a tool, an ***institution*** goes with it where the principles of quality are built into the organization as the ***name*** is built in the tool.

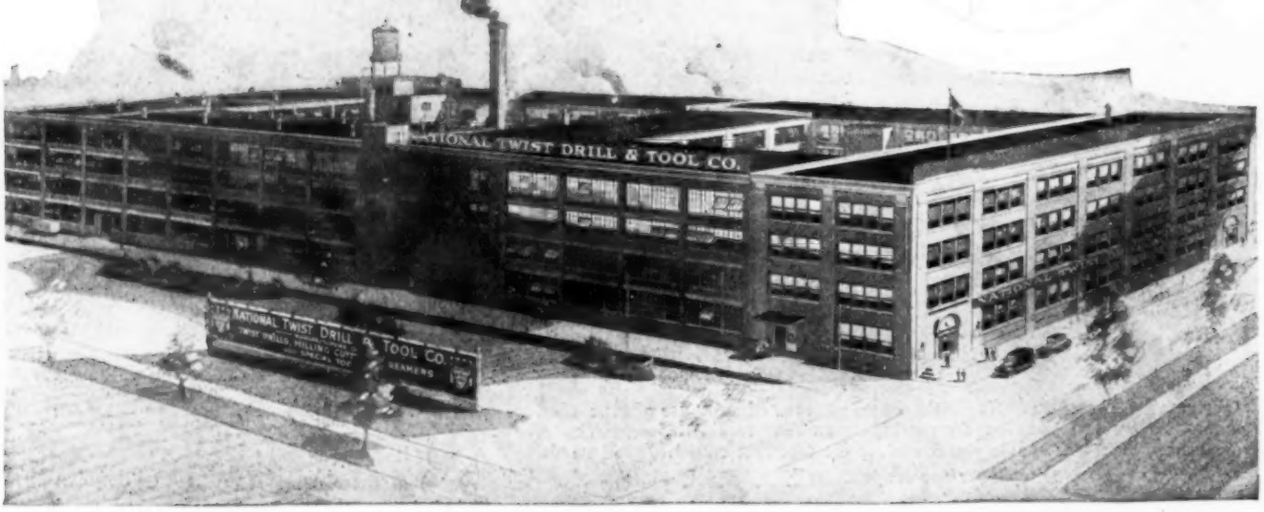
TWIST DRILLS-REAMERS-CUTTERS

National Twist Drill & Tool Company

New York Office: 30 Church St.

Chicago Office: 565 Washington Blvd.

DETROIT, U. S. A.



H&G

Here, Gentlemen, Are the Differences—

HERE are just a few of the many *different* points in the design of the H & G Automatic Self-Opening Die Head which will chase old man TROUBLE right out of your shop.

The chasers on the H & G are held firmly over the cutting edge thus eliminating taper threads.

The quick release insures cutting the thread to a given point every time, and also right up to the shoulder where required.

The cams are enclosed so that chips cannot clog the head or cause the size of thread to change.

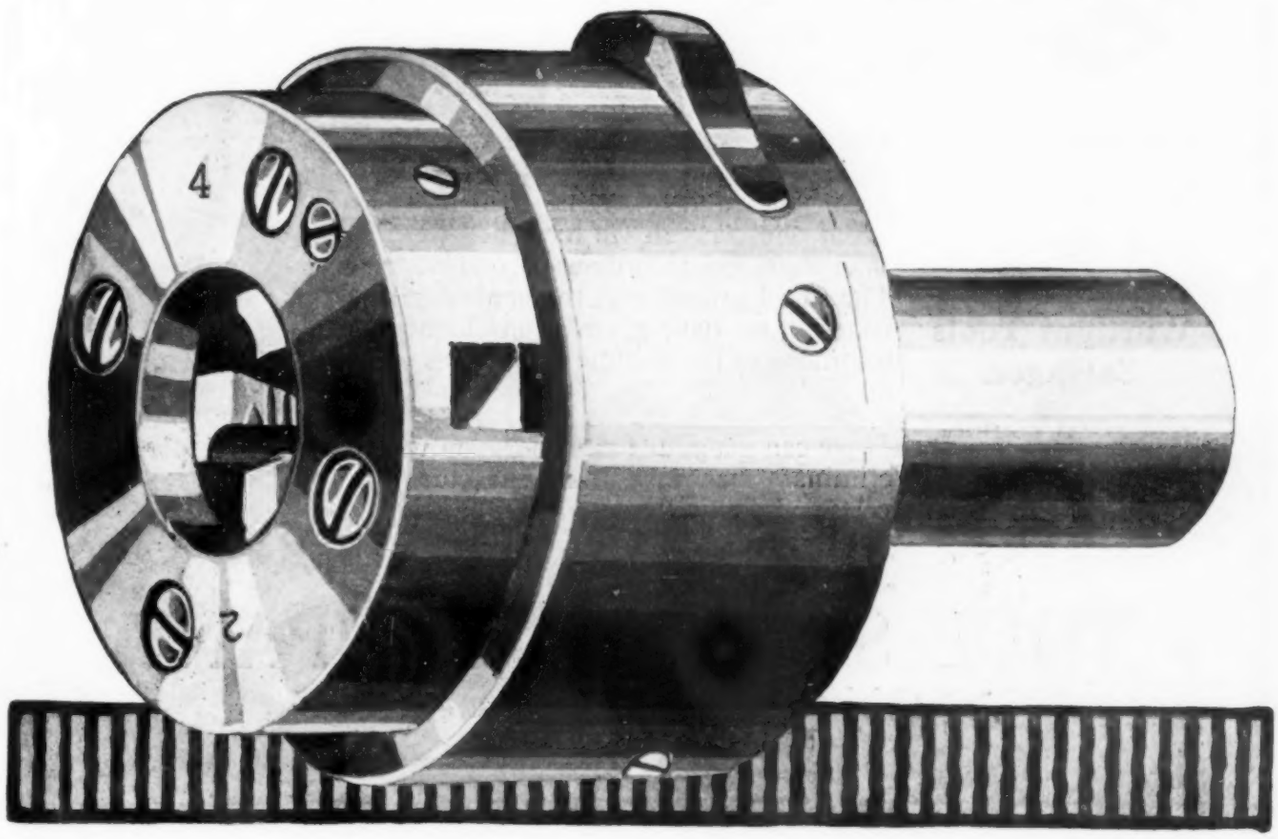
The opening of the head is positive since it is operated by a cam rather than the usual springs.

The H & G is quickly adjusted to suit the size of the work by simply loosening a screw and moving a dial graduated in the thousandths of an inch.

There are other interesting points in the construction of the H & G Die Head. They are explained in our new booklet. Shall we send you a copy?

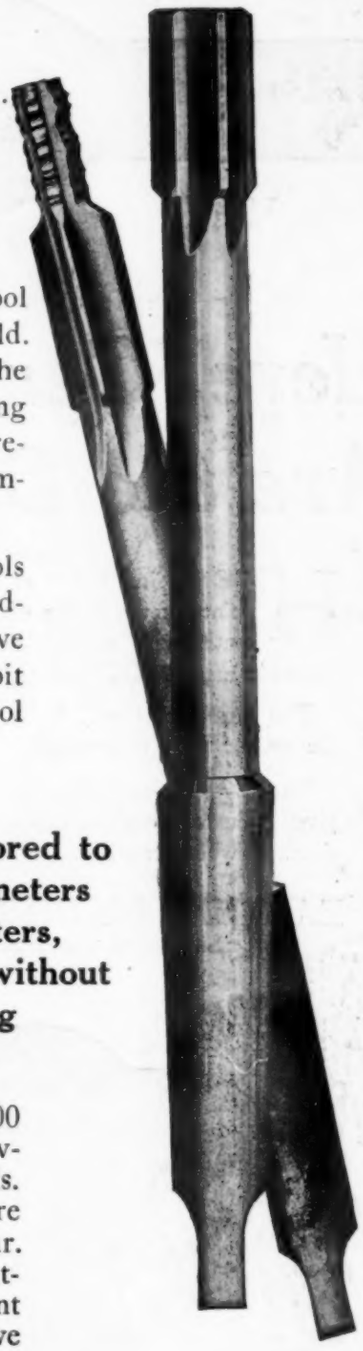
EASTERN MACHINE SCREW CORPORATION, New Haven, Conn.

Representatives in Great Britain: Geo. W. Goodchild & Partners, Eagle St., Southampton Row, London, Eng.



A SERVICE

that will effect a great saving in Your Manufacturing Costs

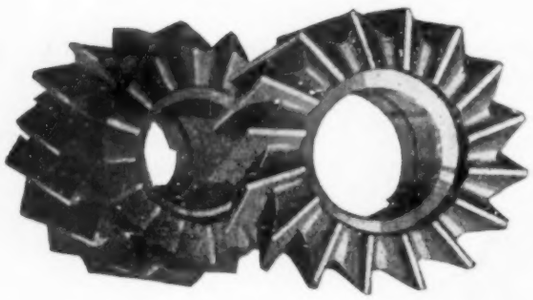


Pioneers

We are the originators of the Tool Salvage industry throughout the world. We hold the patents for recutting the teeth and otherwise repairing milling cutters as well as on our process for restoring reamers to their original diameters.

Are You Skeptical?

Are you throwing your wornout tools on the junk pile, just as your predecessors did because you don't believe they can be restored? If so, debit yourself from 50 to 75% of your tool room expense.



Reamers Restored to Original Diameters Milling Cutters, Drills, Recut without Annealing

Leading Manufacturers Use It

Last Year Over $1,000,000 Worth of Tools Salvaged

More than 2000 manufacturers, in 400 different lines of business, use this service in the salvage of all their tools. From one concern we have had more than 100 repeat orders in one year. The rapid growth and the general satisfaction we have given is an eloquent testimony to the volume of business we do annually.

Will You Send Us An Order?

If we can get your first order, you will eliminate that waste in manufacturing costs and you will never again be without this service.

TOOL SALVAGE COMPANY

Originators of the Tool Salvage Industry

Detroit, Michigan

Your Link Between
Power and Production
If you are looking toward production—big production—an increase that the coming days will require—you need a belt that stands the pull.
Cocheco Belting more than answers your needs. Cocheco is taken from the center of carefully selected butts. Every inch of it is pure oak tanned, curried by a special process, properly stretched and dried.
Depend upon Cocheco as your link between power and production.
Send for the Cocheco Circular
Mr. Modern Manager
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Dover, New Hampshire
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COCHECO

Steel Handles

MOORE

Stillson Wrenches

are superior wrenches in every detail. The highest grades of materials, most expert workmanship, ease of operation and excellence of finish, establish quality.

Moore Wrenches are sold on a **Money Back Guarantee,** but the tools are so good that mechanics prefer them to the money. That's why **Moore** can **Money Back** them.

Practically every material entering into the makeup of **Moore Tools** is manufactured in the **Moore Plant.** We can therefore back its quality.

Our list is interesting to ever wrench user. You should have it in your files

Moore Drop Forging Co.
Springfield, Mass.

Also large makers of Drop Forgings

Safes Representatives: Surplee, Dunn & Co,. 76 Murray St., New York City, and 34 North Clinton St., Chicago, Ill.

QUALITY MOORE TOOLS TRADE M MARK MOORE DROP FORGING CO. SPRINGFIELD MASS. U.S.A.

Wood Handles

SPECIAL FEATURES
OF THE
Beeman's "Time-Saver" Lathe Center

The *self oiling feature* provides for a *constant flow of oil* at the point of center.

It does away with the use of white lead in the center hole.

It *eliminates the oiling of the center hole* of the material before placing work on lathe an *again stopping* the machine to back out center for re-oiling.

The *Interchangeable Point* is a *time* and *money saver.* It is easily and quickly replaced when worn out or in need of regrinding.

The points are made of *Special Alloy Tool Steel* and the shanks of *High Carbon Tough Steel.*

Carried in stock in Morse Tapers from Nos. 2 to 7 and in Brown & Sharpe from Nos. 7 to 11. Special sizes to order. Points are ground to 60 or 70 degrees.

Users are finding it a big *profit producer.*

Just say you're interested and we'll gladly tell you more about them.

EVERY ONE IS GUARANTEED TO BE RIGHT

The center with interchangeable points

MANUFACTURERS' HARDWARE CORPORATION, Milwaukee, U. S. A.

The Gale-Sawyer Company
Boston, Mass.

Gale-Sawyer Adjustable Blade Expansion Reamer

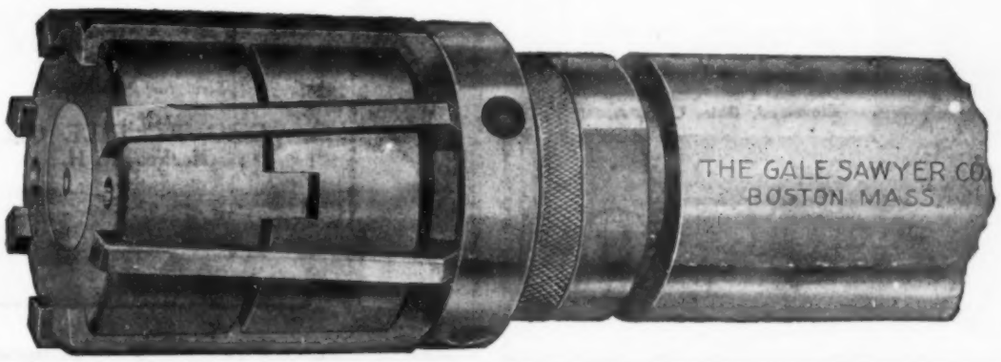
A reamer designed to meet the demand for a high speed, accurate reaming tool that combines efficiency of action with simplicity of adjustment.

It is an adjustable blade reamer with the blades held firmly in place in the body by a patented grip which eliminates all need of screws, taper pins, wedges, etc.

All the blades can be loosened at once, saving time in the interchanging.

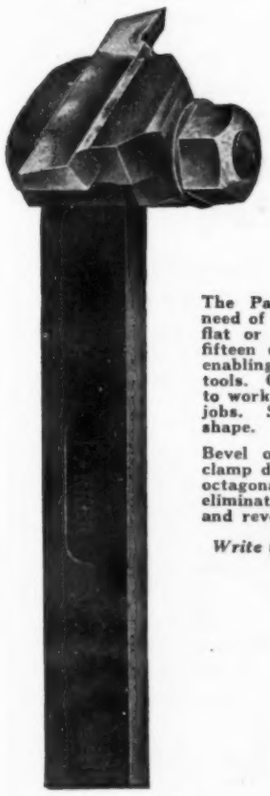
Can be used either as a hand reamer or machine reamer. All blades can be adjusted forward at once by a simple adjusting collar.

Get our bulletins and prices on Gale-Sawyer Inserted Tools.



PARKER UNIVERSAL TOOL HOLDER

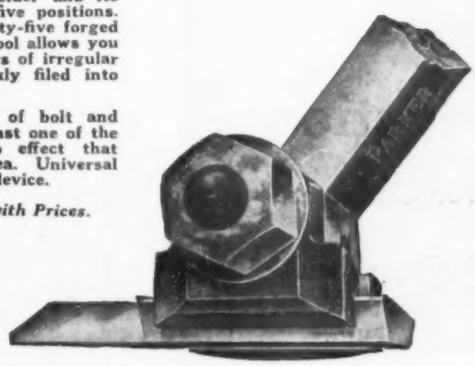
With Cutters Equals 75 Tools



The Parker Universal Tool Holder meets every need of Lathe, Planer and Shaper. It holds square, flat or round cutters. With one holder and its fifteen cutters you can get seventy-five positions, enabling you to do the work of seventy-five forged tools. Open face at cutting point of tool allows you to work up to shoulders and in corners of irregular jobs. Special cutters may be quickly filed into shape.

Bevel or dove-tailed gripping faces of bolt and clamp draw the cutter positively against one of the octagonal faces, with a backing-up effect that eliminates chatter. Wide clamping area. Universal and reversible, with positive locking device.

Write today for Illustrated Circular with Prices.



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QUALITY FIRST

Will meet more rapid milling service—Quality cutters for quality work.

Plain Milling Cutters, Side Milling Cutters, End Mills, Angular Cutters, Convex Cutters, Concave Cutters, Shell End Mills, Interlocking Side Milling Cutters, etc., Metal Slitting Saws, Special Cutters

HIGH SPEED STEEL ONLY

We make nothing but Milling Cutters. Send inquiries.

QUICK DELIVERIES

Cowles Tool Company
Cleveland, Ohio, U. S. A.

Grover

J.B.G. Files

Files and File Handles

A combination you will have to go far to beat.

J. B. G. files have been giving satisfaction in discriminating shops for over twenty years. They are economical, long lasting and sharp cutting. Made in both American and Swiss patterns.

Grover file handles are practically unbreakable. They have long pressed steel ferrules with head. Wood filler can be replaced indefinitely.

Send for Particulars

GROVER FILE CO.
Nashua, N. H.

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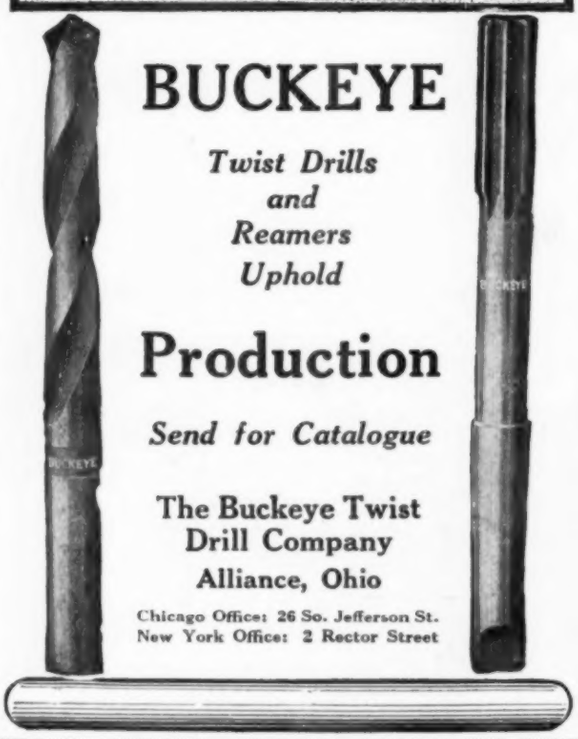

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Twist Drills and Reamers Uphold

Production

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The Buckeye Twist Drill Company
Alliance, Ohio

Chicago Office: 26 So. Jefferson St.
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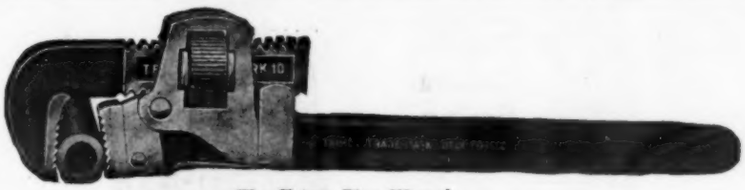
SHOW WONDERFUL

Heavy Duty Results. Want to know why?

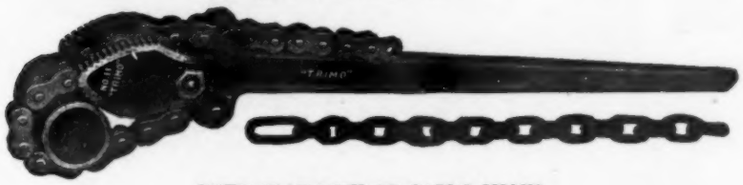
CLARK EQUIPMENT CO.
Office and Works: Buchanan, Mich.

Canada—Rudel-Belnap Machinery Co., Montreal and Toronto. Great Britain—The Coats Machine Tool Co., 14 Palmer St., London, S. W. Japan — Andrews & George, Tokyo.

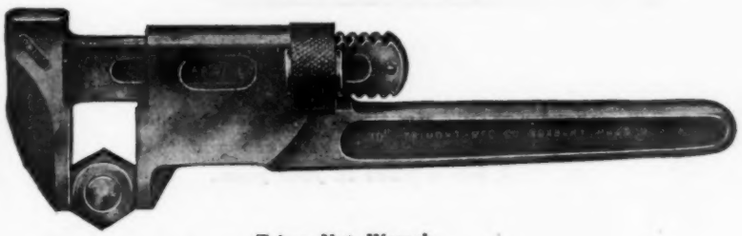
For Heavy Duty Drilling & Reaming



The Trimo Pipe Wrench
Made with Wood Handles in 6-in., 8-in. 10-in. and 14-in. Sizes; with Steel Handles in All Sizes.



WITH FLAT-LINK OR CABLE CHAIN
Trimo Chain Wrench



Trimo Nut Wrench
6-in., 8-in., 10-in., 12-in., 15-in., 18-in. and 21-in. Sizes.

Especially Suitable for Railroads

TRIMO

The Word Trimo

stands for good tools made by the Trimont Mfg. Co., which are the following:

The Trimo Pipe Wrench
The Trimo Chain Pipe Wrench
The Trimo Monkey Wrench
The Trimo Pipe Cutter (Hand)
Sold at Same Price as Others

The Four Good Points

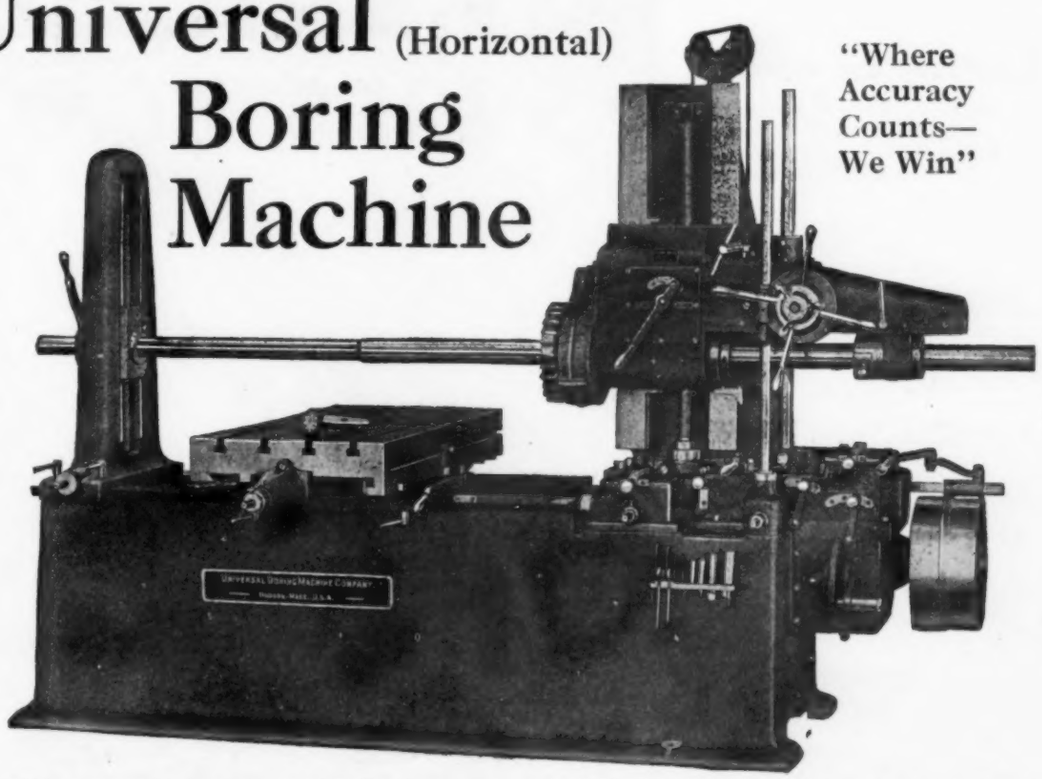
that make the ***Trimo Pipe Wrenches*** superior are the ***Spiral Spring*** always in place—***Steel Frames*** that will not break—***Nut Guards*** that protect adjustment nut—and the ***Inserted Jaw in handle*** that can be replaced when worn. ***Save money*** and buy Trimo goods, made by

TRIMONT MFG. COMPANY, 55-71 AMORY STREET, ROXBURY, MASS., U. S A.

Send for Catalog No. 75, describing our Complete line.

Universal (Horizontal) Boring Machine

"Where Accuracy Counts—We Win"



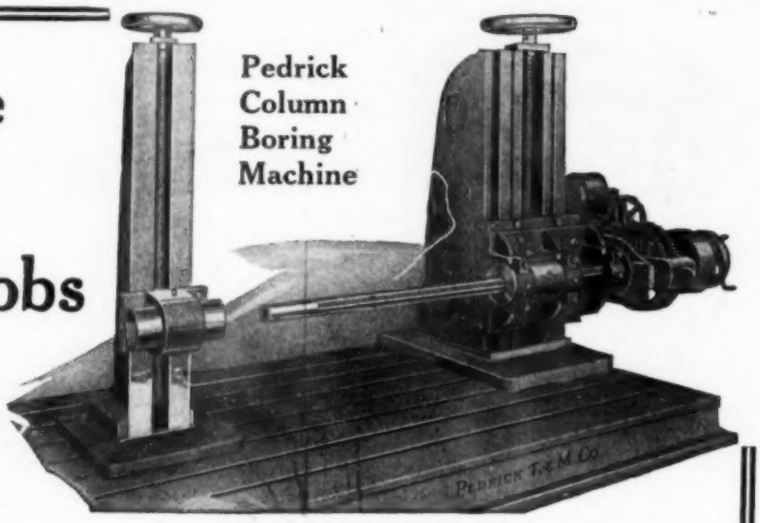
UNIVERSAL BORING MACHINE CO., Hudson, Mass.

Save the Time of Moving Those Heavy Jobs

The *Pedrick Column Boring Machine* is not so bulky or unwieldy as to prevent its being moved to the job where the occasion requires.

Further, it has many unusual features that appeal to manufacturers in all branches of work. It is simple to the extreme and is so geared as to require far less horsepower to operate than other machines of this class.

Its outstanding feature is the boring bar. This may operate as an ordinary spindle or remain in a fixed position while the cutter travels along it.



Pedrick Column Boring Machine

Send for full details of this modern machine tool. They will convince you that it has a place in your plant.

Pedrick Tool & Machine Co.
3637 N. Lawrence St., Philadelphia, Pa.

AMERICAN SWISS FILES

Why they are superior

Competent judges, in comparing "American Swiss" with imported Swiss files, have found points of difference in manufacture wherein "American Swiss" excel.

The noticeable features of superiority are these: teeth sharper, shapes more correct, dimensions more uniform, edges and points well covered, more uniform in temper, file surface more evenly covered by the teeth.

Try one today

American Swiss File & Tool Company
E. P. Reichhelm & Co., *Selling Agents*
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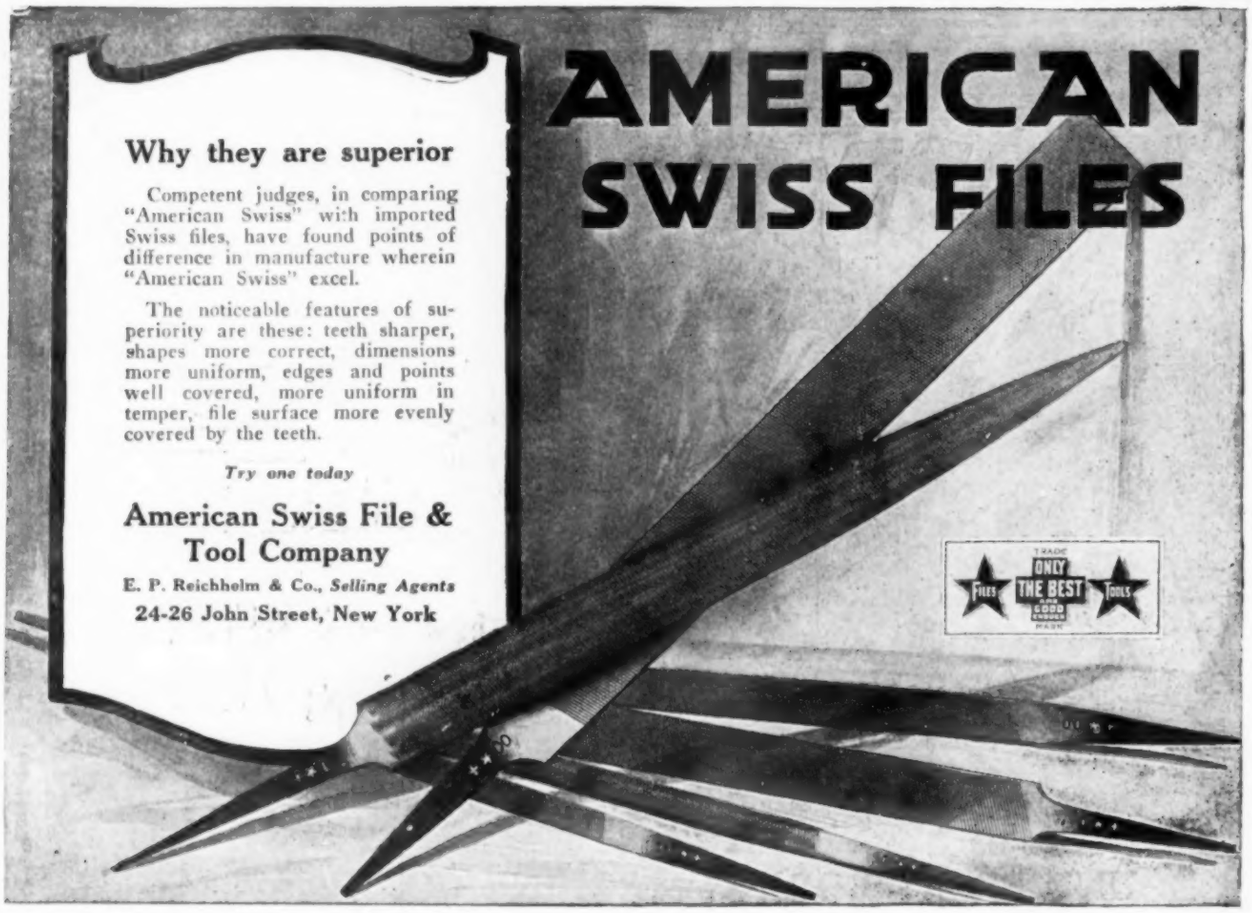


There is Real Efficiency in the S & C Easy-Lock Holder

IT will allow you to get much more use out of your cutters, it will save you time in making adjustments and it will go a long way towards speeding up your cutting work.

A simple turn of the wrist locks the cutter in the holder. No spanner wrench needed. No screws to hold it tight. This saves time, increases cutting production.

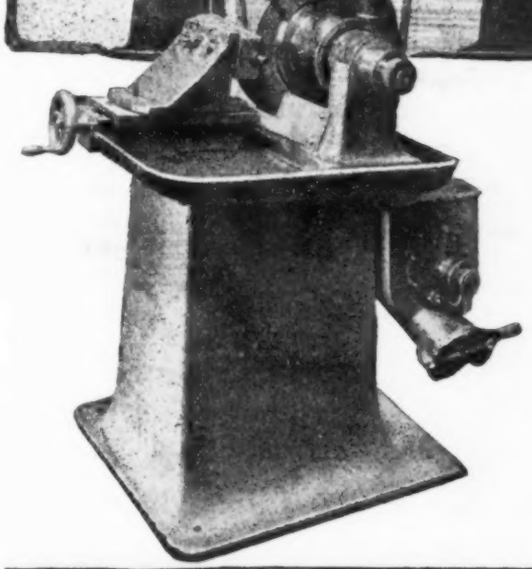
The cutters can be sharpened all the way down to one-third of their length. The pilot shank, being threaded, provides for the take up. This means a considerable saving in new cutters.

The shank of the cutter has a two-point drive instead of set screw drive—this means double strength.

Easy-Lock Holders and Cutters are made in sizes for every class of work.

Write us for further information

S & C MFG. CO.
368 Mt. Elliot Ave., Detroit, Mich.



So many are writing, asking for production on piston pins or wrist pins.

Here's our formula: Use it yourself.

Diameter	Ft. of Pins per Hr.	Diameter	Length	Pcs. per Hr.
1.250—1.249	20-ft.	1¼	4	60
1.000— .999	22-ft.	1	3¾	70
.750— .749	24-ft.	¾	3½	82
.500— 4.99	28-ft.	½	2	168

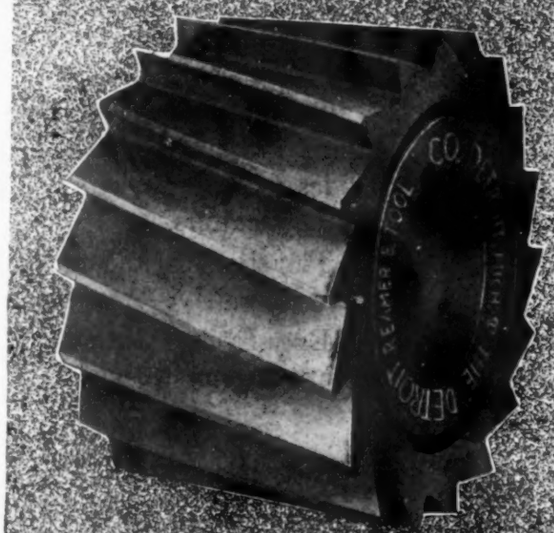
For the sake of acquainting the public with the quality of work possible we grind FREE OF CHARGE 25 OR 50 SAMPLES FOR ANYONE. Write us today.

DETROIT TOOL CO.
DETROIT

CUTTERS
Made the Detroit Way

ANY machining job requiring the use of a cutter, mill or special tool can be done *better* with a Detroit. The material, design, workmanship and finish are such as to make them in demand by careful workmen.

Detroit Cutters are regularly made of high-speed steel, but may be had in carbon steel if so ordered. A Detroit user *always* looks for the trade-mark. Try it once and see how quickly you will form the habit.



Our booklet lists Detroit Tools. Send for it and see the full line.

Detroit Reamer & Tool Co.
Detroit **Cleveland**

These are the Teeth that Don't Clog

Wherever Costs Count—

if machine work is part of the process, VIXEN FILES are welcomed, by both superintendent and labor.

VIXEN FILES do more work with less expenditure of energy and do it faster than any other type of file made. The teeth are so formed that they **cut** instead of scrape, at the same time that they shed the cuttings.

They cost more, of course, but save money because they **do more** and **can be sharpened and resharpened.**

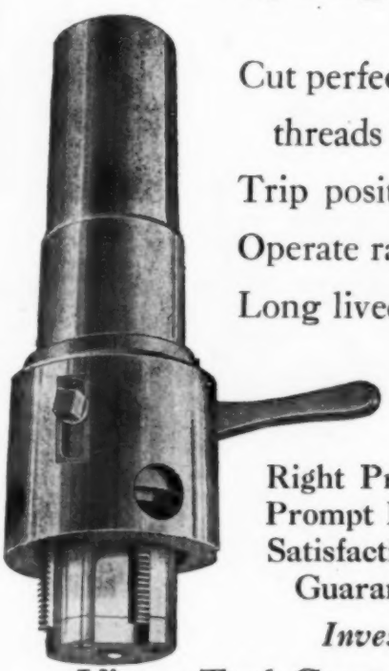
How much do they save?

Actual figures for you, if you write.

Vixen Tool Company, Newark, N. J.

CURVED TOOTH
VIXEN FILES

VICTOR
Collapsing Taps



Cut perfect threads
Trip positively
Operate rapidly
Long lived

Right Prices
Prompt Delivery
Satisfaction Guaranteed
Investigate

Victor Tool Company
Waynesboro, Pa., U. S. A.

R. & T. CO.

"Keystone"=Satisfaction

"KEYSTONE REAMERS"
Universally Satisfactory

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Reamers, Cutters and Small Tools
Millersburg, Pa., U. S. A.

New York Office, 30 Warren St. Chicago Office, 180 N. Market St.

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Where rigidity is essential use "Lovejoy Tools"

See how the cutter is positively locked, the tool thrust being taken on the locking key which, in turn, takes its seat on the solid metal of the holder.

For heavy turning facing and planing operations "where rigidity is essential," the Lovejoy Inserted-Cutter Type Tool is most efficient and economical.

Our patent method of locking the cutter in position is clearly shown in the phantom illustration. You can readily see it is impossible for the cutter to slip even under the heaviest intermittent cuts.

It will pay you to investigate the possibilities of Lovejoy Inserted-Cutter Type Tools in your shop.

Ask us to send a copy of our catalog on "Lovejoy Metal Cutting Tools."

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SPRINGFIELD, VERMONT, U.S.A.

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Small Tools

show their worth in your production sheet. They help increase output of your big, expensive machines. They are high in quality and low in price.

Get our price list and note savings to be had.

The Advance Tool Company

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WHY NOT?

install this die for accurate threads at a fast rate of production.

CHASERS can be furnished in time for your requirements.

THE IDEAL TOOL & MFG. CO.

BEAVER FALLS, PA.

Do Your Reaming with the

CASHMAN

Adjustable Shell Reamer

It will do your work at ***lower cost*** and do ***more*** than any other.

Order a Cashman Reamer on Trial

CASHMAN TOOL COMPANY

Park Street, Waynesboro, Pa.

Worth Hundreds of Dollars In Solid Tools

Were you to buy solid tools to do the work this Hall Adjustable Universal Counter-bore, End Mill, Hollow Mill and Boring Tool will do, it would cost you hundreds of dollars and results would not be one bit better.

Try one in your shop—you will be convinced.

Write for complete information

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Foreign Agents:
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Milling Cutters and Reamers
Special Formed Cutters

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Some other reader may have just what you want—and he may be in the market for the items you wish to turn into cash.

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54

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—For it presses shafts and bushings through long bores or pushes arbor in and out of pulleys, gears, etc., in about one-half the time required by any other method; it's also used for punching, bending and broaching; in fact it has a thousand shop uses. And No. 3 Arbor Press costs only $39.50 F. O. B. New York.

When you write about the Nicholson Arbor Press we will send you our book on

NICHOLSON Expanding Mandrels

A set of these expanding mandrels fit any hole from ¼ inch to 7 inches *instantly*. The time your workmen now spend in calipering a score or so of old fashioned solid mandrels will be saved and show on your bank balance.

You can use either of these Nicholson appliances for thirty days and if you find that they don't save you time and money send them back, collect.

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Prices Right — Reliance Supreme Quality

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Prices Consistent

The best stock in America

High Speed & Carbon Drills
Reliance Supreme Quality
Prices Interesting

We can give you every size from 1/64 to 3 inches Immediately—No Waiting

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AMERICAN FORGED H.S. TWIST DRILLS

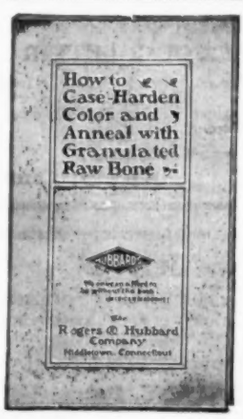
Are supplying the demand for greater production

In Competition

Material Tool Steel 35% Carbon. ½-in. Drill.
Competitor No. 9, No. 8, No. 3.
Competitors Nos. 9 and 8 failed to drill one hole.
Competitor No. 3 drilled 1½ holes.
American Drill drilled 6 holes.

Incorporated into them is the material and workmanship that will meet the highest standards of your production.

American Twist Drill Company
Detroit, Michigan



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It tells all you want to know about case hardening, annealing and coloring and it's yours for the asking.

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Twentieth Century Balancing Tools

Always level, no matter how or where placed. Will save enough time and worry on one job to pay for themselves. Designed especially for balancing

Pulleys
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Drive, Shrink or Sliding Fits can be made to "mike" measurements with Critchley Improved Expanding Reamers. Each reamer has six high-grade tool steel blades, slightly staggered in assembly to prevent chatter.

These reamers will accurately finish any hole from 15-32 to 1 17-32 inches. They expand from 1-16 in. in the smaller sizes to 3-16 in. in the largest. A set of these reamers will solve your whole finishing problems. Send for circular and note their features.

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MADE BY
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Save Time, Drills, Money and Material

and avoid the possibility of accidents in your drilling work. All this can be accomplished simply by equipping your drill presses with

Quickgrip Table Vises

They are the only vises of their kind on the market. Will fit any drill press and increase the capacity of your table to 16-ft. x 24-in. They grip the work firmly and instantly and the piece cannot slip beneath the drill. This means the saving of many broken drills and much spoiled work. No need of ever holding the work by hand avoids accidents. Have us tell you all about this new vise.

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will give you your accurate production. Tested 20,000 per hour

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Acquaint us with your problems, thereby making use of our many years of experience.

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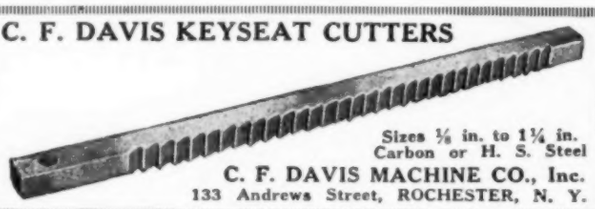
3909 Second Ave., Brooklyn, N. Y.

C. F. DAVIS KEYSEAT CUTTERS



Sizes ⅛ in. to 1¼ in. Carbon or H. S. Steel

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Charles Engelhard

the original Le Chatelier

Pyrometers

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TAPS

⅛ to 5 inches

Prompt quotations made on your specification — prompt deliveries on your order. Latest equipment throughout plant.

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CONSULTING ENGINEER

Particular attention given to the design of Special Tools, Fixtures and Machinery

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CLOUGH'S PATENT DUPLEX GEAR CUTTER

One Pair of these Cutters cuts every size gear from 12 teeth to a rack of same pitch. Gears run with B. & S. Involute. Regular pitches kept in stock. Special Cutters made to order.

Catalog of small tools free.

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The recently designed Badger Grinder, incorporating many practical ideas which are the result of years of experience, places the disc grinder on the list of necessary machine tools.

Disc Grinder information gladly furnished.

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E. B. Gardner, Pres. "Disc Grinder Service"; R. D. Gardner, Treas.

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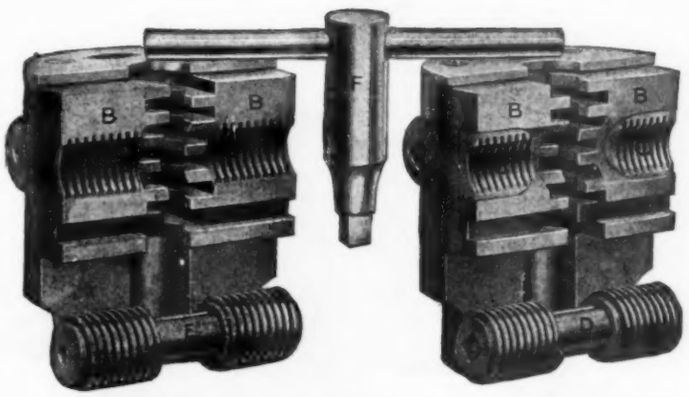
Our service is constructive betterment applied to industrial plants, aimed to increase production, reduce costs and improve industrial relations.

Our position in our field warrants your consideration.

C. E. KNOEPPEL & COMPANY, INC.
Six East 39th St. *Industrial Engineers* New York

Familiar?



Are you familiar with the Cooler Twin Screw Drill Chuck? Do you know that it is as strong as it could possibly be made—a body of close grain cast iron reinforced by a steel cap plate to prevent spreading, jaws and screws of high carbon steel.

Do you realize that the two large screws operated by a key with handle of unusual length provide a grip of remarkable power to the jaws?

And last do you know about the accuracy of this tool—how it is guaranteed not to run out of true more than .006 of an inch on a hardened and ground arbor 6 inches from the face of the chuck?

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MARVIN & CASLER COMPANY
Canastota, New York

CASLER
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Universal Tool Holders

For use in Lathes and light work in Planers and Shapers

Used for cut-off, cutting forms, discs, grooves, gauges, keyways, slots, radius, taps, turning, boring, broaching and all kinds of threading.

Adjustable right or left any angle up to 90 degrees, takes $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{5}{16}$ in. round, $\frac{1}{4}$ in. square, $\frac{5}{32}$ x $\frac{1}{16}$ in. flat bits and circular forming or threading tools on either side. Size shank $\frac{1}{2}$ x $1\frac{1}{16}$ x 6 in. Complete in one unit, minutely accurate for tool work.

Price $7.50 net. If your dealer does not carry the Universal, send your order direct to us. Shipped express or parcel post collect to all parts of the world.

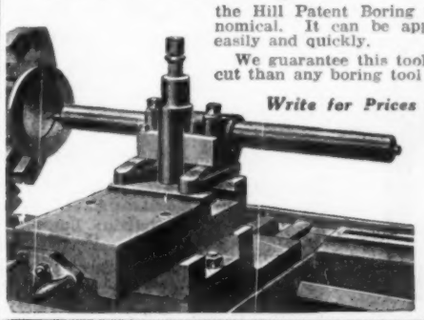
Universal Tool Holder Co., Cleveland, Ohio

For Boring, Facing and Turning

the Hill Patent Boring Tool is most economical. It can be applied to any lathe easily and quickly.

We guarantee this tool to take a heavier cut than any boring tool made.

Write for Prices and Details



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Orange Mass.

REYNOLDS Screw Driving Machine

Drives 16,000 screws a day. Automatic. Magazine fed. A boy can run it. Drives wood or machine screws. Widely used in important plants. **Write for Bulletin.**

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will locate the
Man you want
Position you want
Equipment you want

Are you using the Searchlight?

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HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE
DELTA FILE WORKS, Philadelphia
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FILES OF QUALITY

Precision Milling—

WHERE accurate, light milling jobs, on tools, jigs and fixtures, are performed, no machine can be found to handle the work with more dispatch and exactness than this one.

The Ames Bench Milling Machine is extremely sensitive and well adapted to operations of exact precision and high finish.

Yet it has the compact, rigid construction to handle medium heavy work with the same speed and accuracy.

Our booklet goes into detail regarding this machine. Shall we send you a copy?

B. C. Ames Company
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Production!

Our 20-in. all-geared, self-oiling drill is noted for continuous high speed production. Abundant power, instant, easy control. Speed changes 8; feed changes 8.

Catalogue A Has the Details

Barnes Drill Co., Inc. 1907
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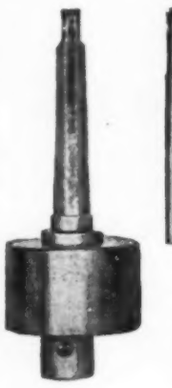

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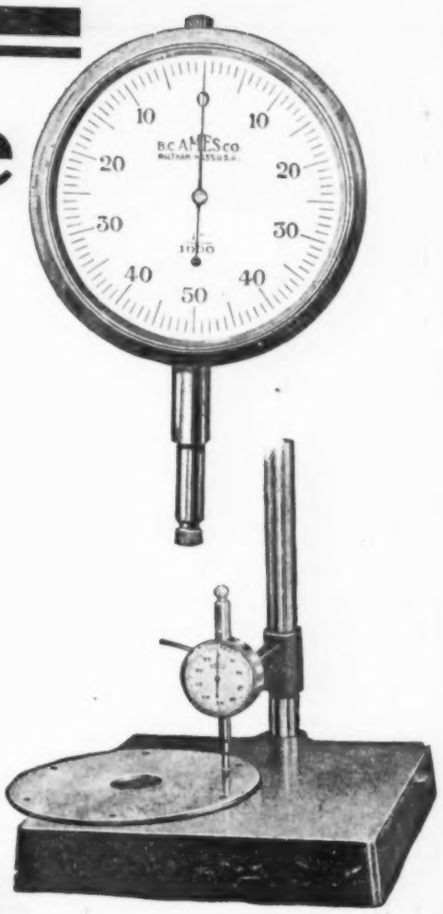

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1—No. B Milwaukee Plain.
1—No. 20 Ohio Universal.
1—No. 1 Dow Plain.
3—No. 1-A Brown & Sharpe Universal.
1—No. 2-G Hendey Universal.
9—No. 2 Kempsmith Plain.
1—No. 2-A Garvin Plain.
2—No. 3 Cincinnati Plain.
1—No. 3 Cincinnati Universal.

BORING MACHINES

2—30-in. Bullard Vertical.
1—51-in. Bullard Vertical.
1—2½-in. bar Cleveland Horizontal.
1—3½-in. bar Binsse Horizontal.

TURRET LATHES

5—19-in. LeBlond Universal.
34—19-in. LeBlond Combination.
16—20-in. American Combination
12—21-in. LeBlond Universal.
4—21-in. Gisholt.s.
32—24-in. Steinle.

GRINDERS

1— 6 x 32-in. Norton Plain.
4—10 x 36-in. Norton Plain.
2—10 x 50-in. Norton Plain.
1—No. 2 Bath Surface.

LATHES

1—14-in. x 6-ft. Reed-Prentice.
12—14-in. x 6-ft. Reed Ex. Hvy. Pl. Tng.
7—16-in. x 6-ft. Reed Engine, C.R.
12—17-in. x 6-ft. LeBlond Rapid Production, C.R., Q.C.G.
6—17-in. x 8-ft. LeBlond Engine C.R., Q.C.G.
21—18-in. x 8-ft. Boye & Emmes Engine, D.B.G., C.R.
8—18-in. x 8-ft. Boye & Emmes, D.B.G., C.R., Q.C.G.
18—18-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
65—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
35—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G. P.F.T.
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16—20-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G., P.F.T.
113—20-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G.
58—21-in. x 10-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
10—25-in. x 10-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
33—26-in. x 10-ft. Niles Engine, D.B.G., C.R., Q.C.G.
3—26-in. x 12-ft. Putnam Motor Driven Engine, C.R., Q.C.G.
75—26-in. x 10-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
30—26-in. x 12-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
16—26-in. x 14-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
7—26-in. x 16-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
10—26-in. x 18-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
5—26-in. x 20-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
9—30-in. x 11-ft. American Gd. Hd. Engine, C. R., Q.C.G.
3—30-in. x 15-ft. American Gd. Hd. Engine, C.R., Q.C.G.
3—30-in. x 20-ft. American Gd. Hd. Engine, C.R., Q.C.G.
23—32-in. x 12-ft. Pittsburgh Engine, D.B.G., C.R., Q.C.G.
4—40-in. x 12-ft. Fifield Engine, Trip. Gd., C.R.
4—40-in. x 18-ft. Fifield Engine Trip. Gd., C.R.

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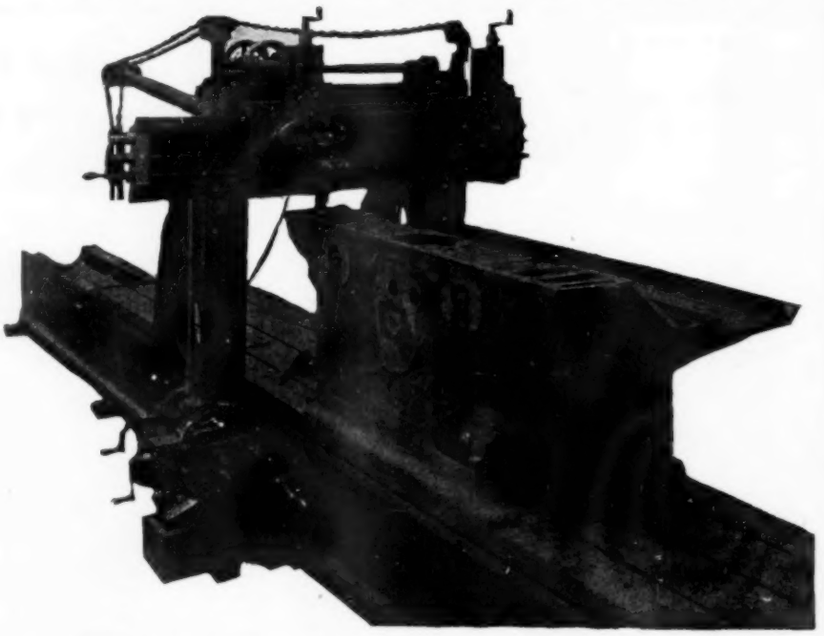

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14 x 6 Worcester.
14 x 6 Rockford Q.C.G. Taper Draw-in.
15 x 6 Sebastian.
15 x 10 Sebastian Gap.
16 x 6 Hendey C. R. Taper in pan.
16 x 6 Draper R & F.
16 x 6 Putnam R & F.
16 x 8 Reed Plain Rest Taper.
16 x 8 Reed Heavy Duty C. R. Taper in pan.
16 x 8 Perkins C. R.
16 x 8 Bradford.
18 x 8 Prentiss C. R.
18 x 8 Flather C. R. Q. C. G.
20 x 12 Sidney Q. C. G.
20 x 14 Reed Q. C. G.

SCREW MACHINES

No. 55 National-Acme, 1⅝.
No. 3 Wood Tilted Turret P. F.
No. 4 D. & W. G. F. H., P. F.
No. 22 Garvin Monitor.
No. 20 Reed Chucking
No. 515 National-Acme ⅜.

DRILLS

No. 1 Langelier H. S. b.b. Bench.
1-spindle Millbury, Plain.
1-spindle Taylor & Fenn, Plain.
2-spindle Allen b.b. Sensitive.
3-spindle Allen b.b. sensitive.
3-spindle Dwight Slate, Plain.
4-spindle Allen b.b. Sensitive.
20-in. Wheel & Lever.
20 B. G. P. F. W. & L.
26-in. Sibley Sliding Head.
26-in. Hoefer Sliding Head.
3-ft. Taylor & Fenn Sensitive.

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Whiton Hand No. 2½ Standard Spur Bevel Mitre.
No. 3A Cincinnati.

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10-in. and 12-in. Diameter.
Garvin Surface.
Abrasive Surface.
No. 1 Norton Tool and Cutter.
No. 2 Norton Tool and Cutter.
No. 2 Morse Plain 6 x 30.
No. 2½ Bath Universal "C."
No. 2 B. & S. Universal old type.
No. 1 Landis Universal

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No. 1 Standard Vertical.

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Bickford Hand P. F.
Bickford Hand P. F. Vertical.
No. 3 Bristol Vertical.
No. 21 Garvin, Plain.
No. 25 Bilton, Plain B. G.
No. 1 Kempsmith Universal.
No. 2 Kempsmith Universal.
No. 2 Cleveland Universal.
Becker Heavy Hand Millers.

PRESSES and DROPS

No. 1 Foot Presses.
No. 1A Adams S. A. Power Press.
No. 4 Greenerd Arbor Press.
No. 5 Greenerd Arbor Press.
No. 68N Bliss Roll Feed.
No. 5 Standard Embossing Press.
50-lb. Standard, Plain Drop.
100-lb. Standard, Plain Drop.
150-lb. Standard, Automatic Drop

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30 x 30 x 10 Powell.
30 x 52 x 14 Whitcomb-Blaisdell.
48 x 60 x 12 N. B. P. Shapers.
15-in. Hendey Friction.

SHAPERS

15-in. Potter & Johnston.
16-in. Ohio, Plain.
16-in. Whipp, Plain.
20-in. Kelly B. G.
24-in. Walworth B. G.
7-in. Rhodes Horizontal Old Style Shaper.

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No. 3 Crescent Saw Table.
12-in. Crescent Jointer.
24-in. Crescent Surface Planer.

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15—2¾-3¾-in. Cleveland, Model "A"
8—7/8-in. Cleveland, Model "A"
11—2¼-in. Gridley, Single Spindle
13—3¼-in. Gridley, Single Spindle

TURRET LATHES

3—No. 1 Warner & Swasey Plain Head, Bar Capacity, 5/8 in.
4—No. 1 S. P. Garvin Plain Head, Bar Capacity, 5/8 in.
3—No. 2 S. P. Garvin Plain Head, Bar Capacity, 1⅛ in.
16—No. 11 S. P. Garvin Plain Head, Bar Capacity, 1⅛ in.
16—No. 2 Biggs Plain Head, Bar Capacity, 1 in.
46—No. 3 Stecker Superior Friction Back Gear, Bar Cap., 1 5/16 in.
8—No. 4 Biggs Friction Back Gear, Bar Capacity, 1½ in.
16—No. 4 Milwaukee Friction Back Gear, Bar Capacity, 1½ in.

LATHES

3—6-in. x 30-in. Dalton
1—12 x 5 Worcester
2—14-in. x 6-ft. Earl
100—No. 2 Garvin Screw Head Shaving

GRINDERS

1—No. 4 Gardner Disc
2—10 x 32 Bridgeport Cyl.
3—Gisholt Tool
Blount, Diamond, Excelsior, Etc., Floor

MILLING MACHINES

1—No. 2 Kempsmith, Plain
1—No. 6—62-in. Becker, Vertical
24—No. 0 Burke, Bench
7—Carter-Hakes, Bench
26—No. 3 Burke
26—No. 1 Toledo (Kent-Owens)
18—Wisconsin
9—H.-M. (Foster) Thread Miller

SHAPERS and PLANERS

1—16-in. Ohio Back Geared Crank
1—72-in. x 60-in. x 24-ft. Hamilton, Motor Drive (4 heads)

DRILLS

60—No. ½ Avey H. S. Bench, 3/8-in. Cap.
4—Leland-Gifford H. S. Bench
75—Sigourney Sensitive
120—Pilton Sensitive
20—No. 1 Langelier Sensitive
8—Leland-Gifford 2-spindle Bench
5—Allen Pedestal
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10-ft.-16-ft. Niles, 2 heads, heavy, fine condition.
14-ft. Standard, 2 swivel heads.
8-ft. 10-ft. Hilles & Jones, swivel head.
90-in. Pond, 2 swivel heads.
62-in. Niles-Bement-Pond, 2 swivel heads, single pulley drive, heavy duty, latest type.
52-in. Bridgeport Bullard, 2 swivel heads.
42-in. Bullard, swivel and 4-sided turret head.
30-in. Bullard, swivel head.
Detrick & Harvey Vertical Boring Machine, 7-in. bar, 8-ft. x 9¼-ft. bed.
No. 2 Barrett Horizontal Cylinder Boring Machine, 5-in. bar, heaviest pattern, 98% new.

DRILLS—RADIAL

7-ft. American Universal.
6-ft. Baush, belt or motor drive, plain.
6-ft. Bickford semi-universal, gear box drive.
5½-ft. Fosdick plain, motor drive.
5½-ft. Niles semi-universal, box table, etc.
5-ft. Niles-Bement-Pond, motor drive.
5-ft. Baush, motor drive.
5-ft. Prentice, belt drive.
5-ft. Universal Co.'s Universal.
4-ft. Universal Co.'s column drive.
3½-ft. Gang, belt drive.
30-in. Dreses Mueller.

MULTIPLE SPINDLE

Bickford 10-spindle, rail drill.
5-Spindle Baush, 2-in. spindles, 1-in. cap.
No. 2 Baush, 16 spindles.

UPRIGHT

No. 25 Foote Burt.
6-Spindle Barnes Upright Double Drill Press, back geared.

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No. 28 Brown & Sharpe Grinding Machine, 18-in. x 96-in.
No. 5 Bath Duplex, complete, 98%.
No. 2½ Bath Universal, complete.
No. 15 Besley Pattern making, disc 30-in. x ¾-in.

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250 to 500 lb. Sellers steam drop.
1500-lb. United Eng. Co.'s board drop.
1000-lb. Bliss Board Drop.
Two (2) Merrill 800-lb. Board Drops.
300-lb. Bradley Upright Helve.
60-lb. Bradley Helve.
25-lb. Bradley Helve.

ENGINE LATHES

52-in. x 22-ft. New Haven, triple geared, face plate drive.
50-in. x 18-ft. Fifield, triple geared, face plate drive, raising blocks to 72-in.
36-in. x 18-ft. Putnam heavy duty taper.
2—36-in. x 14-ft. Putnam heavy duty.
26-in. x 12-ft. Putnam, quick change, heavy duty.
20-in. x 8-ft. Lodge & Shipley, geared head.

ENGINE LATHES (Continued)

20-in. x 10-ft. Hamilton, double back geared, compound rest, power cross feed.
18-in. x 9-ft. Bell, semi-quick change, heavy duty.
18-in. x 8-ft. P. W. Pond.
16-in. x 8-ft. Reed Prentice, latest.
16-ft. x 6-ft. Reed.
14-in. x 6-ft. Carrol, taper attachment

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Two (2) Farrell Foundry, table 20-in. x 36-in. (rotary table 24-in.), weight 8000 lb.
Two (2) Newton Vertical, heavy duty, 36-in. diameter, cutter head.
Bradley Profiler, sliding table 9-in. x 22-in., 3-in. spindle.

MILLING MACHINES

No. 3 Le Blond, heavy duty, geared head.
No. 3 Hendy, plain.
No. 2 Hendy, plain.
No. 2½ Garvin Universal.
Brainard Slab Miller, 76-in. x 36-in. x 12-ft.
Five (5) Becker Lincoln type, No. 7H.
No. 32 Kempsmith Lincoln type.
Four (4) Whitney No. 6.

PLANERS

90-in. x 90-in. x 25-ft. Farrell Foundry, 2 heads.
60-in. x 48-in. x 20-ft. Gleason, side and 2 rail heads.
42-in. x 42-in. x 12-ft. Pond, 2 heads.
36-in. x 36-in. x 18-ft. Pease, 2 heads.
36-in. x 36-in. x 12-in. Cincinnati, heavy duty, 2 heads.
30-in. x 30-in. x 14-ft. Flather, 2 heads.
30-in. x 30-in. x 6-ft. Gray, 1 rail, 2 side heads.
30-in. x 30-in. x 8-ft. Bement Miles, 2 heads.
30-in. x 30-in. x 10-ft. Powell, 2 heads, new.

PRESSES

Twenty-five (25) Farrell, No. 1 to 6, strokes 2-in. to 9-in.
No. 27K Bliss, weighs 70,000 lb.
No. 512 Bliss, triple acting, 33-ton working pressure.
Adriance inclined, platen 22-in. x 30-in., 1¾-in. stroke.
No. 1 Bliss, geared, 14-in. stroke.
DA4 Ferracute, roll feed, double acting, weighs 7000 lb.
Ferracute Knuckle Joint Embossing, 100 ton.

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Betts Punch—20-in. gap, cap. 1-in. thru 1-in.
Cleveland Punch—19-in. gap, ¾-in. thru ¾-in.
Henry Pels Coping Machine, armor plate, cap. 10-in. I-beam.
Bement Horizontal Punch, 60-in. gap, cap. 1½-in. thru 1½-in., weighs 30,000 lb.
Newbold Rotary Splitting Shear, capacity ¾-in., throat 28-in.
No. 61 Carlin Alligator Shear, 30-in. blades, cap. 5-in. round.

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10-ft. Bement Boiler Plate.
Ten (10) Rolls, distance between housing from 17-in. to 32-in., 90% new.

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LATHES

13-in. x 6-ft. Willard Precision High Power Tool Room Lathe, 3-step cone, double back geared, quick change gear box, complete with oil pan and pump, draw-in attachment, including 1 collet, cabinet legs and taper attachment, swing over bed 13¼ in., swing over carriage 7¼ in., distance between centers 38 in., hole through spindle 1⅛ in., size of lathe tool 1¼ x ¾ in. Net weight 1750 lb. **Stock No. M1030.**

15-in. x 8-ft. Milwaukee, 3-step cone, double back geared Lathe, independent change gears, quick change feed, swing over bed 18½ in., over carriage 11½ in., distance between centers 3 ft. 10 in., weight 2900 lb. **Stock No. M916.**

24-in. x 10-ft. bed Ryerson-Milwaukee Heavy Duty Engine Lathe, 3-step cone, double back geared, swing over bed 24½ in., swing over carriage 15¾ in., distance between centers 5 ft. 4 in., size of lathe tool ¾ x 1¼ in., quick change feed, independent change gear, mounted on double cabinet legs, complete with regular standard equipment. Net weight 5600 lb. **Stock No. M918A.**

24-in. x 12-ft. Lathe, per above, weight 6100 lb. **Stock No. M918B.**

24-in. x 14-ft. Lathe, per above, weight 6700 lb. **Stock No. M918C.**

24-in. x 16-ft. Lathe, per above, weight 7250 lb. **Stock No. M918D.**

30-in. x 12-ft. Heavy Duty Advance Engine Lathe, 3-step cone, double back geared, quick change gear box, complete with compound rest, standard tool holder, steady and follow rests, swing over V's 32½ in., swing over compound rest 22¼ in., distance between centers 6 ft., size of lathe tool 1 x 2 in., net weight 11,700 lb. **Stock No. M1005.**

30-in. x 16-ft. Advance Lathe, per above, weight 13,000 lb. **Stock No. M1007.**

50-in. x 40-ft. Fifield Triple Geared Lathe, takes 33 ft. between centers, swings 36 in. over carriage, 5-step cone for 5-in. belt, fitted with compound rest, complete with double friction countershaft. Weight approximately 36,800 lb. **Stock No. M1054.**

PLANERS

36 x 36 in. x 18 ft. bed Heavy Pattern Rockford Planer, complete with two heads on cross rail and equipped with aluminum drive pulleys, length of working surface of table 18 ft., width of table 32 in., length of bed 30 ft. 0 in., distance between V's 16½ in., length of down feed 12 in., ratio return to cutting speed 3-1, total height 7 ft. 5 in., total width 7 ft. 5 in., arranged for belt drive. Net weight 23,000 lb. **Stock No. M578.**

36 x 36-in. x 10-ft. Ryerson-Martin Planer, with two heads on rail, standard belt drive, complete with countershaft, weight 20,000 lb. **Stock No. M999A.**

36 x 36-in. x 12-ft. Ryerson-Martin Planers, with two heads on rail and two side heads, weight 21,000 lb. **Stock No. M999B.**

36 x 36-in. x 14 ft. Ryerson-Martin Planer, with two heads on rail and two side heads, weight 23,000 lb. **Stock No. M999C.**

36 x 48-in. x 16-ft. Ryerson-Martin Planer, maximum distance between top of table and cross rail 36 in., maximum distance between housings 48 in., length of table 16 ft., equipped with two heads on cross rail only; arranged for belt drive, complete with regular equipment, net weight 24,000 lb. **Stock No. M999D.**

SHAPERS

14-in. Rockford Back Geared Crank Shaper, actual length of stroke 16¼ in., horizontal travel of table 20 in., vertical travel of table 13½ in., top of table 11 x 16 in., keyseating capacity 3 in., size of vise jaws 2½ x 10 in., vise opens 12 in., complete with vise, wrenches and table support and countershaft, arranged for belt drive, net weight 2250 lb. **Stock No. M570.**

20-in. Rockford Back Geared Crank Shaper, actual length of stroke 20½ in., horizontal travel of table 25 in., vertical travel of table 14 in., top of table 13 x 20 in., keyseating capacity 2½ in., size of vise jaws 2½ x 12 in., vise opens 14 in., complete with vise, wrenches, table support and countershaft, arranged for belt drive, net weight 3500 lb. **Stock No. M571.**

16-in. Steptoe Back Geared Crank Shaper, complete with vise, wrenches and countershaft, weight 2350 lb. **Stock No. M1077A.**

20-in. Steptoe Shaper per above, weight 3300 lb. **Stock No. M1077B.**

SHAPERS (Continued)

24-in. Steptoe Shaper per above, weight 3800 lb. **Stock No. M1077C.**

The following Machine Tools and Metal Working Machines are in stock for immediate shipment, subject to prior sale.

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DRILL PRESSES

20-in. Rockwell Stationary Head Upright Drill Press, equipped with automatic feed, hand wheel and hand lever feed, back geared, furnished with gear guards, spindle sleeve bored for No. 4 Morse taper, diameter of table 16 in., capacity to drill 1 in. hole in cast iron or steel, arranged for belt drive. Net weight 675 lb. **Stock No. M400.**

30-in. Sibley Sliding Head Drill, diameter of table 26½ in., Morse taper hole in spindle No. 5, capacity to drill 2-in. hole, equipped with geared feed, hand wheel and hand lever feeds, fitted with gear guards and arranged for belt drive, net weight 2200 lb. **Stock No. M462.**

4-ft. Arm Ryerson Plain Radial Drill with speed box and single pulley drive, Morse taper hole in spindle No. 4, capacity to drill 3¼-in. hole in cast iron, capacity pipe tap in cast iron 4 in., working surface of base 36 x 46½ in., working surface of table 20 in. square. Net weight 750 lb. **Stock No. M868.**

Washburn No. 2 High-Speed Ball Bearing Sensitive Drill, single spindle, table 18 x 16 in., spindle travel 6½ in., hand feed, capacity to drill ½-in. hole, net weight 735 lb. **Stock No. M980.**

BORING AND TURNING MILLS

60-in. C. M. C. Horizontal Boring Machine, diameter of spindle 4¾ in., length of spindle 1 in. power feed of spindle 38 in., horizontal adjustment for spindle 48 in., maximum distance spindle to table 30 in., size of table top 48 x 27 in., longitudinal travel of table 4 ft. 9 in., transverse travel of table 18 in., vertical adjustment of table 28 in., arranged with cross feed and right angle revolving table, arranged for motor drive. Net weight 20,000 lb. **Stock No. M1025.**

PUNCHES

Ryerson-Kling Horizontal Punch, 7-in. throat, capacity ¾ x ¾ in.; architectural jaw; clutch with adjustable automatic stop; belt drive, weight 5600 lb. **Stock No. M1067.**

12-in. throat Horizontal Punch, capacity 1¼-in. hole through 1-in. material, fitted with clutch having adjustable automatic stop, cast steel architectural jaw, and arranged for belt drive, with tight and loose pulley. Net weight 10,000 lb. **Stock No. M856.**

Ryerson-Kling Fly Wheel Punch, capacity to punch ½-in. hole through ½-in. material, depth of throat 18 in., when properly equipped will shear ⅝-in. plate, ¾ x 3½ in. flat bars, ½-in. round bars, 2 x 2 x¼-in. angles, fitted with architectural jaw and automatic stop, net weight 3400 lb. **Stock No. M983.**

Ryerson-Kling Vertical Cored Frame Geared Punch, 15-in. throat, capacity ¾-in. hole through ¾-in. plate, equipped with architectural jaw; clutch with adjustable automatic stop, when equipped with shearing attachments, will shear ¾-in. plate, 5 x 1¼-in. bars, 1¼-in. rounds, 3 x 3 x ½-in. angles, weight 7500 lb. **Stock No. M1075.**

Ryerson-Kling Punch, per above, with 24-in. throat weight 8000 lb. **Stock No. M1062.**

Ryerson-Kling Punch per above, 36-in. throat, weight 9000 lb. **Stock No. M887.**

Ryerson-Kling Punch per above, 48-in. throat, weight 12,000 lb. **Stock No. M1068.**

Ryerson-Kling Vertical Cored Frame Punch, capacity to punch continuously 1¼-in. hole through 1-in. plate, depth of throat 18 in., when equipped with proper attachments will shear ¾-in. plate, 1¼-in. rounds, 6 x 1-in. bars or 4 x 4 x ½-in. angles, equipped with architectural jaw and arranged for belt drive, with tight and loose pulley, net weight 12,000 lb. **Stock No. M1069.**

Ryerson-Kling Punch per above, 24-in. throat weight 14,000 lb. **Stock No. M1070.**

Ryerson-Kling Vertical Cored Frame Punch, capacity to punch continuously 1¼-in. hole through 1-in. plate, depth of throat 36-in., when equipped with proper attachments will shear ¾-in. plate, 1¼-in rounds, 6 x 1-in. bars or 4 x 4 x ½-in. angles, equipped with architectural jaw and arranged for belt drive, with tight and loose pulley, net weight 16,000 lb. **Stock No. M855.**

PUNCHES (Continued)

Ryerson-Kling Punch per above, with 48-in. throat weight 19,000 lb. **Stock No. M908.**

Ryerson-Kling Punch per above, with 72-in. throat, weight 26,000 lb. **Stock No. M979.**

Ryerson-Kling Vertical Cored Frame Punch, capacity to punch 2-in. hole through 1-in. material, depth of throat 48 in., when properly equipped will shear 1-in. plate, 2½-in. round bars, 8 x 1½-in. flat bars and 6 x 6 x½-in. angles, equipped with architectural jaw arranged for belt drive with tight and loose pulley, net weight 26,000 lb. **Stock No. M854.**

No. 8 Whiting Vertical Punch, capacity to punch 1 in. hole through 1-in. material, depth of throat 36 in., when properly equipped will shear ¾-in. plate, 6 x 1-in. flat bars, 4x4x ⅝-in. angles, 1⅛-in. round bars, equipped with architectural jaw and arranged for belt drive with tight and loose pulley, net weight 16,000 lb. **Stock No. M852.**

Whiting Punch per above, with 48-in. throat, weight 19,000 lb. **Stock No. M853.**

No. 4 S. C. A. P. Ryerson Quadruple Combined Punching and Shearing Machine, capacity to punch ¾-in. hole through ¾-in. material, depth of throat 10 in., will shear plates to 1 in., length of blades 8 in., will shear flat bars ¾ x 4 in., round bars up to 1¼ in., square bars up to 1 in., shear angles up to 4 x 4 x ⅝ in., tee bars up to 3 x 3 x ½ in., cope I beams and channels 5 in. lightest section, notch angles and tees up to 3 x 3 x ½ in., net weight 3400 lb. **Stock No. M371.**

SHEARS

No. 2 Lennox Rotary Bevel Shear, capacity to shear ½-in. plate and lighter, depth of throat 3 in., to be arranged for belt drive, net weight 5900 lb. **Stock No. M2.**

No. 3 Lennox Rotary Bevel Shear, capacity to shear 1-in. plate and lighter, depth of throat 4 in., to be arranged for belt drive, net weight 8900 lb. **Stock No. M3.**

8-ft. Lennox Rotary Splitting Shear, double housing type, capacity to split mild steel plates up to and including ½ in., furnished with one set of milled tool steel blades, roller hold down, net weight 10,000 lb. **Stock No. M15.**

8-ft. Lennox Rotary Splitting Shear, double housing type, capacity to split mild steel plates up to and including 1 in., furnished with one set of milled tool steel blades and roller hold down attachment, net weight 22,000 lb. **Stock No. M901.**

No. 1 Lennox Serpentine Shear, capacity to shear No. 16 gauge material and lighter, net weight 250 lb. **Stock No. M745.**

No. 2 Lennox Serpentine Shear, capacity to shear No. 10 gauge stock and lighter, net weight 550 lb. **Stock No. M641**

No. 3 Lennox Serpentine Shear, capacity to shear ¼-in. stock and lighter, net weight 1250 lb. **Stock No. M710.**

Ryerson-Kling No. 1 Guillotine Type Bar Shears, capacity 1¼-in. rounds, 4 x ½-in. flats; equipped with clutch having automatic stop, belt drive, weight 5600 lb. **Stock No. M1065.**

D. H. Stoll No. 472 Power Gap Shears, cutting edge 73 in. long, capacity ⅜-in. mild steel, housings with 20-in. gap, weight 9000 lb. **Stock No. M1049.**

BULLDOZER

Ryerson-Kling No. 6 Bulldozer 20-in. stroke, face of crosshead 16 x 64 in., die space 46 in., weight 25,000 lb. **Stock No. M.**

Ryerson-Kling combined beam bender and horizontal punch, capacity 12-in. I-beams about smaller axis, punch side architectural jaw, 10-in. throat capacity 1 x 1 in., weight 24,000 lb. **Stock No. M995.**

BORING BARS

4-in. Ryerson Portable Cylinder Boring Bar, boring capacity diameter 10-28 in., length backhead down 44 in., length backhead up 52 in., number of heads 6, number of feeds 2, number of speeds 3. **Stock No. M152.**

MILLING MACHINES

Ryerson-Conradson No. 3 plain, heavy duty, single pulley drive, geared feed, table 63½ x 12½ in., range 34 x 16¾ x 20 in., weight 5575 lb. **Stock No. M886.**

Ryerson-Conradson No. 3 Universal Miller, range 34 x 10 x 20 in., weight 5910 lb. **Stock No. M886A.**

JOSEPH T. RYERSON & SON

MACHINERY

CHICAGO NEW YORK BUFFALO ST. LOUIS DETROIT

Machinery and Equipment For Sale

The machinery and equipment listed herewith has been released by the termination of the war. It is *all* in excellent working condition. Machine shops and factories will find many needful items in our stock which are now ready for inspection and delivery. The following items are only a partial list. Stock includes other machine tools, small tools, electrical apparatus and general factory equipment.

Lathes—Semi-Automatic

112—Reed-Prentice 14-in. x 6 multiple tool semi-automatic engine lathe. Standard equipment additional cam bar.

Turret

144—Reed-Prentice, 14-in. x 6-ft. converted engine Lathes, S.B.G., friction head, 1¼-in. hole in spindle, 2¼-in. hole in turret, 10-in. Hannifin Chuck, air equipped, 28 countershafts.

Warner-Swasey No. 4 Turret Lathes, 16 In. x 6 Ft.

20—Air equipped, 10-in. Hannifin Chucks, standard equipment, with 11 C.S.
7—Standard equipment without cross slides.
5—Standard equipment with countershafts.

Smur & Kamen Turret Lathes

7—No. 2 standard equipment, 12 x 3½ in., 6 C.S.
2—No. 3 standard equipment, 14 x 4½ in., C.S.

Gisholt Type "A" Turret Lathe, 18 In. x 8 Ft.

8 B.G. hole in spindle, equipped with 12-in. Hannifin air cylinders and special hinge jaw chucks, suitable for hand operated, jaw type chucks, power cross feed on slide, power feed on carriage. Gisholt Co. will supply tail stocks and compound rests to convert into engine lathe.
16—Equipped as per above with C.S.
3—Without air equipment, 2 with C.S.
39—Bullard Turret Lathes, 18 in. x 6 ft. hand power, cross slide, 2 speed countershaft, direct drive, no back gears, 16-in. diameter pulley, 3-in. face, 4-hole turret, turret to face of chuck, 22 in.

Engine

LeBlond Heavy Duty, 17 In. x 6 Ft.

28—Equipped with compound rest, face plates, tail stocks and spindle attachment, which may be used for taper attachment, C.S.
15—With Hannifin chucks, air equipped, compound rest, tail stock C.S.
1—With chuck, compound rest and tail stock, C.S.
1—LeBlond Rapid Production, with Hannifin chuck air equipped rest, tail stock.

Reed-Prentice, 14 In. x 6 Ft.

36—Equipped with sets change gears, tail stocks, 27 face plates, cross slides, with special attachment Hannifin chucks, air equipped, 30 C.S.

Lo Swing Fitchburg

37—7-in. x 7 ft., equipped with std. tool post and special tool post for profiling with C.S.
1—Symington Lathe.

Cut-Off Machines

10—Williams 4-in. chuck, air equipped, C.S.
20—Symington, 4-in. chuck, air equipped.
8—Symington, 4-in. chuck.
8—Davis 4-in. chuck, C.S.
6—David 4-in. chuck, air equipment, C.S.
7—Hurlburt Rogers, 4-in. chuck, air equipped, C.S.
25—Hurlburt Rogers, 4-in. chuck, C.S.
4—Modern 1¼ in.
10—Symington Band Trimmers, 4 in.
8—Symington Band Trimmers, 4-in., air equipped.

Band Turning Machines
Allis-Chalmers

2—5-in. 6—3-in.

Automatic Screw Machines

6—Gridley, 3¼-in., std. equipment, C.S., single spindle.
4—Cleveland, 2¼-in., std. equipment, C.S., single spindle.
1—Hartford, ¼-in., for cutting pins, single spindle.

Thread Millers

10—Lees Bradner 8 in., with C.S.

Tapping Machines

12—Rickert-Shaefer Bench Tappers, size B-16.
2—No. 2X Garvin Tappers, 24 in.
1—Tapping Machine.

Buffers

1—B. A. Wesche Buffer, equipped with 5-hp., 1800-r.p.m., 220-volt, 3-phase, 60-cycle, Type MB-6 Buffing Motor, with pedestal base.
1—B. A. Wesche Buffer, equipped with 5-hp., 1800-r.p.m., 220-volt, 3-phase, 60-cycle, Type No. 6 Squirrel Cage induction motor, buffing stand, pedestal base.
2—Cutter, Wood & Stevens Buffing Heads.
3—Excelsior No. 8 Buffing Heads.

Presses

2—No. 2 R. & K. Presses, O.B.I. type, 2-in. stroke, 5½-in. die space, die plate 10½ x 17 x 1½ in.
1—No. 195 West Press, O.B.I. type, 4-in. stroke, 8-in. die space, die plate 13½ x 22 x 1½ in., Mfg. Shop No. 226-1.
1—West Press, solid-back straight type, 3-in. stroke, 4½-in. die space, but can be adjusted to 24-in. die space, Mfg. Shop No. 4562.
1—No. 45 Crosby Press, O. B. inclined type, 2½-in. stroke, 4½ die space, die plate 15 x 24 x 1½ in.
2—C2 Ferrecute Presses, O.B.I. type, 2-in. stroke, 5½-in. die space.
1—No. 119 Crosby Press, O.B. inclined type, 2½-in. stroke, 5-in. die space, die plate 9½ x 17 x 1 in.
1—No. 2 Ferrecute Press, O.B.I. type, 1½-in. stroke, 4½-in. die space.
1—No. 19 Stiles Press, O.B.I. type, 2-in. stroke, 4½-in. die space, die plate 10½ x 18 x 1½-in.
1—No. 19 Stiles Press, O.B.I. type, 2-in. stroke, 4½-in. die space.
1—No. 20 Wold Press, O.B. inclined type, 2½-in. stroke, 6-in. die space, die plate 15 x 25 x 1½ in.
2—No. 20 Crosby Presses, O.B.I. type, 1½-in. stroke, 5-in. die space, die plate 13 x 18 x 1½ in.
1—No. 3 Robinson Foot Press, 1½-in. stroke, 3½-in. die space.
1—No. 234 Ferrecute Foot Press, 1½-in. stroke, 5-in. die space.
1—Bliss Pendulum Foot Press, 6-in. die space, 2-in. stroke.
1—Bliss Pendulum Foot Press, 6-in. die space, 2-in. stroke.
4—No. 2 Greenard Bench Arbor Presses, lever feed, 5½-in. stroke.
12—Universal Bench Arbor Presses, wheel feed, 2½-in. die space, 8½-in. stroke. (7) have die plates 5 x 6 x ¾ in. (8) have die plates 7½ x 6 x ¾ in.
1—No. 50 Bradley Trip Hammer, 5½-in. stroke.
18—Bliss No. 60½ presses.
2—Bliss No. 27 Embossing presses.
4—Bliss No. 78½ triple geared 32-in stroke presses.
1—Bliss No. 521 two-step Drawing Press.
1—Bliss No. 3½ Toggle Press.
1—No. 16 Bliss 1½-in. stroke, 6 in. die space.
1—No. 40 Crosby 1½-in. stroke, 4½-in. die space.
1—No. 119 Crosby, 1½-in. stroke, 8-in. die space.
2—No. 406-A Adriance Arch, 8-in. stroke, 9-in. die space.

Miscellaneous Presses

3—Lawrie Hydraulic Presses.
2—Metalwood Hydraulic Presses, equipped with 4 x 4 accumulator, weight type 1 x 1 x 1½ auto. bypass valve.

Miscellaneous Machines

1—Drop Hammer, 2-ft. drop, 14 in. between uprights.
4—Dwight Slate Marking Machines No. 11 3 C.S.
1—Washing Machine DeKoven.
1—32-in. Crescent Band Saw.
1—Beach Mfg. Co. Rip Saw, complete with table.
1—Metal Spraying Machine.
2—Paint Spraying Machines.
2—3-spindle Paint Tables, with C.S. (1) ½-hp. motor, direct connected.
1—Bench Milling Machine.
2—Radial Screw Drivers.
7—Radial Screw Drivers, with pulleys, shafting, etc.
9—Hand steel-marking machines, ¼-in. steel type.
1—Pangborn Sand Blast Machine, complete No. 6 A.C., nozzles, gloves, helmets, etc.
1—Pangborn Type AN Hose Sand Blast Machine, two conveyors, 20 ft. each.

Drill Presses

8—S.S. Leland-Gifford, 12-in., with No. 2 Jacobs Chucks, 2 Rockford L. & D. S.S.

Electric Equipment

40—Motors, standard makes, A.C., 220-volt, 60-cycle, 3-phase, 10-, 20-, 30- and 40-hp.
1—100-kva. Ridgway, 2300-volt, 3-phase, 60-cycle Alternator, direct connected to 12 x 16-in. Ridgway, 4-valve horizontal automatic engine, run at 225-r.p.m., complete with oil cups, lubricators, throttle valve, generator complete with all trimmings, lugs, etc., including exciter and belt for same, together with switchboard and all necessary instrumeinnts and switches.

Grinders

2—Norton, 10 x 24-in., standard equipment C.S.
1—Best double head, 12-in. C.S.
6—No. 14 Besley D.H., 15-in. wheels.
1—Townsend, 8 x 20 in.
1—Hoppen wet tool Grinder, 24 in.
1—Blount No. 6 Dey Grinding Machine, with countershaft, adjustable tool rest, wheel guards for 18-in. emery wheel, 3-in. face, 1¼-in. hole.
1—Best double head, 12 in., without stand, C.S.
1—D.H. Emery Stand, on iron table, ¼-in. shaft

Hoists

35—Curtis Reciprocating Air Hoists, 5 in. x 4 ft., 5 in. x 3 ft. 5 in., 7 in. x 4 ft. and 7 in. x 3 ft. 5 in.

Furnaces

3—Quigley Heat Treating Continuous Furnaces, complete units, each consisting of 2 furnaces, 2 Brown electric pyrometers attached to thermometer, Ashcroft gage, hearth, 21 in. wide, 18 in. high, 22 ft. long, gravity feed and hydraulic ram, 1 unit without pyrometers and thermometer, 1 lot of grids.
12—General Combustion Co. Oil Gas No. B-135-17.
4—American Shop Equipment No. 4841, oil, gas.
2—Bellevue Industrial No. 443, oil, gas.
2—Tate-Jones, 10½ x 1½ x 1½-in.
1—Strong, Carlisle & Harris No. 5A, gas.
3—Rockwell Twin-Chamber, double-end, under-fired semi-automatic annealing and Heat-treating Furnaces, with oil burners and all structural iron and steel work and parts complete and with Push Bar equipment for all furnaces. Size of chambers 5 ft. wide by 22½ ft. long. Door opening 5 ft. wide by 18½ in. high. Fire tiling complete for one furnace.
1—Rockwell Rotary Annealing Furnace No. 77.

Miscellaneous Equipment

1—Fairbanks Railroad Truck, 7 ft. long x 5½ x 18 wood deck cast steel wheels.
Assortment of Split Steel Pulleys, Cast Iron and Wood Pulleys, Countershafts, Hangers, Couplings, Pillow Blocks, Collars, Bering, Boxes, etc.
260—Emery Wheels, 20 x 15 x 12½ in.
44—Iron Trucks, 3 trays.
69—Wood Platform Trucks.
2—International Time Recording Clocks, one with 4 racks, 100 cards each; one with 4 racks, 150 cards each.
Assortment of Pipe, Bench and Shell Vises.
2—Shore Scleroscopes, Measuring Scales, etc.
1—Brinnell Type Test Machine and Microscope.
2—Fairbanks Scales, 2000 lb. and 1500 lb. capacities and other platform scales.
1—Worthington, 1½ Centrifugal Pump, 50 gal. capacity.
1—Worthington Pump, 4 in. dia., directly connected to Schutte and Koerting oil cooler, 12 in. dia. and 6 ft. long, serial No. 606. 500 gal. capacity.

Conveyors

2—Jeffreys Conveyor No. 132, 180 ft. long, 365 ft. Hercules chain.
1—J. M. F. Co. Col. Ohio, New Style B Conveyor, 20-ft. link chain rise, Mathews Gravity Conveyor, 3655½ L. ft., 3-in. centers, 4 in. wide, rolls 2½ in. dia., with 90 deg. bends.
Samson Gravity Conveyor, 520 L. ft., 3-in. centers, 4 in. wide, rolls 2½ in. dia., with bends 45 and 90 deg.
1—N. Y. Revolving Portable Elevator, 2½ sq. platform, 8-ft. hoist.
900 ft. Lamps on wood slat Conveyor, 24 in. wide on 2 ft. 6 in. steel stand, with 53-hp. motors, connected and extra stands for conveyors and motors.
1—Lamson Pneumatic Conveyor, 8000 ft. of 4-in. brass tubing, with good dispatching and receiving station, with automatic weighing machine.
5000 ft. Lamson Steel Gravity Conveyor, 6-in. centers, 16-in. rollers, 45 and 90 deg. curves.
1—Baldwin Steel Chain, 50 ft. CP chain No. 95 in 10-ft. sections.
2—Link Belt and Chain Conveyors, driving sprockets and necessary roller chain attached, and other conveyor equipment.

Tanks

3—Cylindrical Tanks, capacity 10,500 gal., equipped with steam coils.
1—Cylindrical Steel Pressure Tank, 5 x 9 7/16 in., shell lap riveted.
1—Rectangular Steel Tank, Tate-Jones, 5 x 6 x 3½ ft.

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Norton & Landis **Cylindrical Grinders.**

Cincinnati, Le-Blonde and Oakley **Tool Grinders.**

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Pratt & Whitney, Bardons & Oliver, Foster, Acme and Woods **Screw**

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FOR SALE

Machine Tools

The following machines are offered subject to prior sale, f.o.b. Detroit, "As Is Where Is." These machines were purchased for the Liberty Motor Division—some of them are new—all are in excellent condition. Inspection can be made at Highland Park Plant of Ford Motor Company.

1—Colton Centering Machine
1—No. 33 New Britain 5-Spindle Chucking Machine
1—No. 3 P. & W. Die Sinker
3—2-Spindle Diamond Gun Barrel Drilling Machines
3—BX 12 Sipp Drill Presses (without table)
3—Small Diamond Surface Grinders
1—C-3-T Grand Rapids Drill Grinder
1—17 in. x 14 ft. LeBlond Universal Turret Lathe
5—17 in. x 12 ft. LeBlond Universal Turret Lathes
4—2¼ in. x 26 in. Acme Flat Turret Lathes
7—21 in. x 12 ft. LeBlond H. D. Automobile Lathes
1—20 in. x 10 ft. Reed-Prentice Engine Lathe
1—20 in. x 12 ft. Reed-Prentice Engine Lathe
3—Becker Heavy Hand Millers
3—ACS Type Becker Double Spindle Vertical Millers
1—No. 3 Becker Vertical Miller
1—No. 3-H Becker Vertical Miller
38—No. 25 Becker Plain Horizontal Millers
1—"B" Briggs Miller
9—No. 2 Cleveland Plain Millers
16—No. 1½ Garvin Duplex Millers
15—No. 2 Garvin Duplex Millers
5—No. 13 Garvin Plain Horizontal Millers
2—No. 1 Kempsmith Plain Horizontal Millers
2—No. 0-½ LeBlond Plain Millers
1—No. 1-B Milwaukee Plain Miller
1—No. 20 Ohio Universal Miller
2—No. 24 Ohio Plain Millers
1—No. 28 Ohio Plain Miller
17—No. 2 P. & W. Hand Millers
2—8 in. Pratt & Whitney Automatic Millers
10—12 in. Pratt & Whitney Automatic Millers
1—4½ in. x 12 in. Pratt & Whitney Thread Miller
1—No. 1 Standard Hand Miller
1—U. S. Machine Co.'s Hand Miller
3—3-H Becker Profiler
6—No. 12 Leland & Gifford 2-Spindle Profiler
3—P. & W. 2-Spindle Profiler
1—Stow Electric Cleaner
1—Set No. 5 Niles Plate 16 ft. Bending Rolls (Pyramid Type)
2—No. 3 Cincinnati Cone Type Millers
2—No. 2 High Powered Cincinnati Millers (New)
1—4 in. Ajax Bulldozer
3—Becker Model "C" Vertical Millers
2—General Electric Centrifugal Compressors—50 hp. Motors
1—No. 165 Fay & Egan Co. Bending Machine (New)

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MILLERS

Quantity	Each
13—Briggs Millers, Type A. Gooley & Edlund Mfg. Co.	$300
31—No. 12 Brown & Sharpe Millers	180
31—No. 0 Bristols (some with vertical milling attachment)	125
13—No. 2 Pratt & Whitney Millers	180 to 240
15—Burke Bench Millers	100
6—Standard Hand Millers	125
1—Standard Vertical Hand Miller	250
11—H. B. Smith Hand Millers	125
2—No. 3½ Fox Millers	180
2—Bement Millers	125
9—Miscellaneous Millers	125
1—Garvin Miller, Lincoln Type	225

MISCELLANEOUS

Quantity	Each
1—Double-barrel Centering Machine (10-ft. bed, 10-in. swing)	$175
2—No. 2 Peerless Surface Machines	115
1—½-ton Yale Electric Triplex Hoist, 2-phase, 220 v., 60 cycle, with 1-ton Brownhoist trolley	200
5—No. 1 Garvin Tapping Machines	30
4—Marking Machines (Dwight Slate)	50
3—Grant Rivetting Machines	75
1—Saw Table	100
2—Circular Saws	40
1—No. 1 American Rip Saw	70
2—Plating Dynamos	20
1—Belt Lacing Machine (Diamond Machine Co.)	25
1—26-in. Extractor with Countershaft friction pulley	90
1—Cylinder Drilling Machine, 12-in. swing, 4-ft. bed, 12-in. spd. throw	25
1—Spindle Drill Press (Henry & Wright)	80
8—2½ Garvin Screw Machines	225
3—12½ Garvin Screw Machines	225
1—No. 3 Foster Screw Machine	325
6—P & W Shaving Machine	250
1—Special Bench Shaving Machine	350

GRINDERS

Quantity	Each
2—Universal Face Grinders	$250
1—No. 3 Circular Grinder	250
2—No. 1 Universal Cutter & Reamer Grinders	400
2—No. 2 Form Cutter Grinders	250
1—Universal Tool & Cutter Grinder	190
2—No. 190 Wells Grinders	140
1—No. 2 Auto Cup Wheel Knife Grinder	125
2—Cleveland Prof. Electric Grinders, 110 v	150
1—Norton Cutter Grinder (Walker Universal)	200
2—Wet Grinders (Wheel 10-in. Face 24-in. Diameter)	150
1—No. 1 Morse Universal Grinder (Morse Twist Drill Co.)	625
1—Con. Semi-Universal Grinder (Middlesex Mach. Co.)	350
2—No. 160 Wells Cutter Grinders	40
3—Bench Grinders	40
1—Pratt & Whitney Fish Tail Cutter Grinder	75
6—Production Grinders	100
2—No. 3 Drill Grinders, 8-in. Wheel	70

LATHES

Quantity	Each
3—Puribil Stud Lathes (14 x 6)	$300
3—14-in. Reed Stud Lathes	200
3—14 x 7 Stud Lathes (Prentiss Brothers)	150
1—12-in. Reed Turret Lathe	400
1—4 x 6 Engine Lathe, Sc. Cut. (P. Blaisdell Co.)	90
1—Speed Lathe (F. E. Reed)	40

SLOTTERS

Quantity	Each
1—Garvin Die Slotter	$250
2—Vertical Die Slotters (Wm. Pilton)	120
1—P & W Die Slotter	100
1—Garvin Die Slotter	50
1—Hand Screw Slotting Machine (D. W. Pond)	70
8—Garvin Die Slotters (30 degree)	350

You will find that the prices asked are extremely low in comparison with those demanded for the same machines elsewhere. Compare them. Every machine is subject to inspection.

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Special Offering

21—No. 2-A WARNER & SWASEY HOLLOW HEXAGON TURRET LATHES; 3¼-in. bar capacity, with automatic chuck—USED ONLY ONE MONTH.
18—No. 20 BRYANT CHUCKING GRINDERS — SOME NEW — OTHERS SLIGHTLY USED.

MACHINE TOOLS AT BARGAIN PRICES

PLANERS

1—36 x 36 x 8-ft. Detrick & Harvey open side, 2-head planer—1 head on cross rail, 1 head on side rail.
1—36 x 36 x 10-ft. Whitcomb 2-head planer.
2—48 x 48 x 14-ft. 4-head Powell planers.
1—24 x 24 x 12-ft. Cincinnati 2-head planer.
1—36 x 36 x 12-ft. Cincinnati 4-head planer.
1—42 x 42 x 14-ft. Gray 2-head planer.

SLOTTERS

1—24-in. Niles-Bement-Pond slotter.
6—18-in. Dill traveling head slotters direct connected to 220 V., D.C., motor, with control apparatus; condition absolutely equal to new. Will sell with or without motor or substitute A.C. motor.

RADIAL DRILLS

1—3-ft. Fosdick plain cone drive radial drill.
1—6-ft. Reed-Prentice plain single pulley drive radial drill.
1—Hoefer horizontal type, belt driven drilling machine.

DRILLING MACHINES

25—Single and 2-spindle high speed Avey drills, No. ½ capacity.
2—24-in. Kern back geared drill presses, power feed to spindle.
2—24-in. Aurora sliding head drill presses.
An assortment of single 2, 3, 4 and 5-spindle Allen high speed drill presses.

PLAIN AND UNIVERSAL MILLING MACHINES

1—No. 4A LeBlond Universal Milling Machine, with dividing head.
1—No. 0 Brown & Sharpe plain milling machine.
12—No. 3½ Fox power feed plain milling machines.
1—No. 2 Becker-Brainerd universal milling machine.
2—No. 2 Kempsmith plain milling machines.
1—No. 2 Van Norman duplex milling machine.
3—No. 3 Kempsmith universal milling machines.
3—No. 3 Kempsmith plain milling machine.

MANUFACTURING MILLING MACHINES AND PROFILERS

1—No. 35 Kempsmith manufacturers milling machine.
5—No. 32 Kempsmith manufacturers milling machines.
7—No. 12 Brown & Sharpe plain milling machines.
5—No. 7 Becker plain milling machines.
2—Becker duplex milling machines, 21-in. between spindles, 30-in. table feed.
6—Leland & Gifford No. 12 profilers.
1—Pratt & Whitney 2-in. spline milling machines.

TURRET LATHES

1—No. 4 Warner & Swasey universal turret lathe.
3—1-in. capacity Hercules machines with wire feed hexagon turret and cross slide.
1—No. 00 Bardon & Oliver.
1—No. 1 Brown & Sharpe.
1—No. 4 Warner & Swasey universal.
12—3 x 36 Jones & Lamson geared feed with both bar and chucking equipment.
4—24-in. x 14-in. Prentice geared selective head lathes.
6—No. 4 Warner & Swasey screw machines.

GEAR HOBBERS

4—8-in. Hercules gear hobbers.
1—24-in. Rhenania gear hobber.

ENGINE LATHES

5—12 x 5 Hercules screw cutting engine lathes.
1—14 x 6 Seneca Falls lathe.
8—18 x 8 American quick change gear engine lathes.
2—18 x 8 Chard lathes.
1—27 x 16 LeBlond motor driven engine lathe driven by D. C. motor.
1—36 x 60 x 16-ft. LeBlond extension bed gap lathe.
1—24 x 12 New Haven motor driven lathe, driven by D. C. motor.
8—18 x 8 Boye & Emmes lathes, quick change gear.
6—16 x 6 Reed Prentice lathes, quick change gear.
2—19 x 8—Sidney heavy duty lathes, quick change gear.
1—20 x 8 Whitcomb Blaisdell lathe, quick change gear.
6—25 x 10 LeBlond heavy duty lathes, quick change gear.
2—14 x 6 Sidney engine lathes, NEW.
2—14 x 8 Sidney engine lathes, NEW.
2—16 x 8 Sidney engine lathes, NEW.
2—20 x 10 Sidney engine lathes, NEW.

GRINDERS

2—No. 1½ LeBlond cutter grinders.
1—Norton Universal cutter grinder.
1—22 x 6 x 12 Abrasive surface grinder with magnetic chuck.
1—No. 1 Fraser universal grinder.
12—No. 20 Bryant Chucking grinders.
2—Reed surface grinders.
1—Pratt & Whitney automatic thread milling machine cutter grinder.
5—No. 2 Walker surface grinders with magnetic chucks.
1—Blanchard 26-in. A. C. motor driven heavy duty surface grinder.
2—10 x 36 Norton plain grinders.

HAND MILLING MACHINES

16—No. 6 Whitney standard hand milling machines.
4—U. S. Machine Tool Co. hand milling machines.
2—Rockford hand milling machines.
2—Burke No. 1 Bench milling machines.

POWER PRESSES

2—No. 1 Sidney presses, NEW.
3—No. 2 Sidney presses, NEW.
1—No. 3 Sidney press, NEW.
1—No. 4 Wold power press.
2—No. 16 Bliss Horning presses.
1—No. 201-D Ferracute press—weight 40,000 lbs.

MISCELLANEOUS

1—No. 50 Little Giant power hammer.
2—Schuchardt & Schutte tooth rounding machines.
1—10-ft. Ohl Brake, 10-ft. between housings, 12 gauge capacity.

This is only part of our large stock of machinery. Send us your inquiries—we may have just the machine you are looking for.
WE OFFER ONLY MACHINES THAT WE OWN OUTRIGHT. WE GUARANTEE THEM TO BE EXACTLY AS REPRESENTED.
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USED EQUIPMENT THAT'S A LITTLE BETTER THAN THE AVERAGE

If you don't see what you want here, drop us a line. We have others

Brainard 84 in. Planer Type Milling Machine.
LeBlond 17 in. Lathe, turret on carriage.
Worcester 14 in. x 6 ft., Std. Equip. 10 in. Chuck.
Pratt & Whitney 52 in. x 52 in. x 20 ft. Planer, two heads.
Bliss No. 59 Embossing Press, 200 ton cap.
Rand Duplex Single Stage Air Compressor, 10 in. x 24 in. x 20 in.

SCREW MACHINES

National-Acme No. 55 Auto., 1⅝-in. cap.
Costello Hand, 1-in. cap.
Garvin Hand, ⅝-in. cap.
Gridley 1⅝-in. Auto., Rebuilt.

MILLING MACHINES

Garvin No. 13 Plain, A-1 cond.
Rockford No. 3 Hand, Vert. att.
B & S No. 7 Plain, 47-in. table.
Brainard Spline, 46-in. table feed.

LATHES

LeBlond 17-in. Automobile Mfg.
Seneca Falls 10-in. x 4-ft., with equip.
American 14-in. x 6-ft., T.A. and D.I. Att.
LeBlond 16-in. x 10-ft., act. swing 17-in.

DRILLS

Allen Two-Spindle BB Sens.
Washburn 14-in. Sensitive.
Bickford 3-ft. Plain Radial.
Bickford 5-ft. Full Univ. Radial.

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Located at Our Various Factories and Stores

LATHES

14 in. x 6 ft. Bradford, c.r.
14 in. x 6 ft. Whitcomb, taper, pan
15 in. x 7 ft. P & W. speed lathe
16 in. x 6 ft. Reed, r. & f. rest
16 in. x 6 ft. Prentice
18 in. x 8 ft. LeBlond, quick change
21 in. x 8 ft. LeBlond, geared head, heavy duty
22 in. x 8 ft. Niles, c.r.
24 in. x 10 ft. Whitcomb, q.c.
26 in. x 26 ft. Niles, c.r.
28 in. x 18 ft. Niles, c.r.
28 in. x 30 ft. Niles, c.r.
30 in. x 14 ft. Niles, c.r.
42 in. x 20 ft. Niles, c.r

TURRET LATHES

2 in. x 24 in. J. & L. cone head
2 in. x 24 in. Warner & Swasey, hollow hexagon
2 in. x 26 in. P. & W. turret lathe
28 in. size J. Gisholt 3¼ in. spindle
24 in. size I Gisholt, 220 volt, motor drive, d.c.
28 in. Milwaukee rigid, 4¼ in. spindle
34 in. size K Gisholt, 4¼ in. spindle

SHAPERS AND PLANERS

18 in. Walcott Rack
20 in. Gould & Eberhardt.
14 in. x 6 ft. Niles single traveling head Shaper
24 in. x 24 in. x 6 ft. Heavy Powel
30 in. x 30 in. x 6 ft. Pond, 2 heads
30 in. x 30 in. x 8 ft. Pond, 2 heads
30 in. x 30 in. x 10 ft. Pond, 2 heads
30 in. x 30 in. x 12 ft. Pond, 2 heads, 220 v. D.C. Reversing Motor Drive
38 in. x 38 in. x 12 ft. Niles, 4 heads
38 in. x 38 in. x 16 ft. Niles, 3 heads
44 in. x 44 in. x 16 ft. Niles, 4 heads
44 in. x 44 in. x 20 ft. Niles, 4 heads
48 in. x 48 in. x 10 ft. Niles, 4 heads
60 in. x 60 in. x 20 ft. Niles, 4 heads
72 in. x 72 in. x 24 ft. Pond, heavy forge, 3 heads

MILLERS AND GEAR CUTTERS

No. 3 Brown & Sharpe universal, old style
No. 5 Brown & Sharpe Vertical, old style
No. 3 36 in. x 8 in. Brown & Sharpe Gear Cutter
No. 4 36 in. x 9 in. Brown & Sharpe Gear Cutter
No. 6 60 in. x 12 in. Brown & Sharpe Gear Cutter
15 in. Gleason Bevel Gear Generator

DRILLING MACHINES

60 in. Niles, heavy vertical
3 ft. Grant Radial Drill and Boring Machine
3 ft. Mueller, cone drive
4 ft. Niles, full universal, 220 v. Motor, D.C.
5 ft. Niles, full universal, 220 v. Motor, D.C.
6 ft. Niles, full universal, 220 v. Motor, D.C.
4 ft. Prentice Speed Box Radial
4 ft. Niles Semi-universal, old style
5 ft. Niles, Semi-universal, old style
6 ft. Niles, Semi-universal, old style

GRINDERS

No. 11 Brown & Sharpe Internal
4 in. x 30 in. No. 11 Brown & Sharpe pl.
10 in. x 30 in. Landis Universal
12 in. x 66 in. No. 4 Landis Universal
39 in. Grindstone Frame Brown & Sharpe

BORING MACHINES

No. 3 Binase Horizontal, 2½-in. spindle, 5 ft. table
No. 1 Bement Horizontal, 2¾ in. spindle, 5 ft. tbl.
No. 2 Bement Horizontal, 3¾ in. spindle, 6 ft. tbl
No. 3 Bement Horizontal, 4¾ in. spindle, 9 ft. tbl
42 in. Niles Boring and Turning Mill
60 in. Bement Boring and Turning Mill

MISCELLANEOUS

Air Compressor, type 10, Ingersoll-Rand, steam driven, capacity 535 ft.
Air Compressor, Ingersoll-Rand Duplex, motor driven, with 35 h.p., d.c motor, capacity 215 ft.
Blower, No. 10 Sturtevant
Blower, No. 70 Buffalo
Blue Print Machine., Wagenhorst, 60 in., vert. cyl.
Crane, 20 ton, 48 span Sellers 220 Motor, D.C.
Engine, 164 h.p. McEwen, direct connected to 100 k.w. generator, d.c., 220 v.
Profiler, No. 3 Automatic, Keller
Saw No. 7 Cold Cut
Saw, 8 in. rounds, Higley
Slotter, 6 in. Bement

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ESTABLISHED 1876

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LATHES

2—13 in. x 4 ft. South Bend
13 in. x 5 ft. 6 in. new Carroll-Jamieson
13 in. x 7 ft. 6 in. new Carroll-Jamieson
14 in. x 5 ft. Lodge & Shipley, Q.C., pan bed, taper attachment
14 in. x 6 ft. Monarch, D.B.G., quick change
14 in. x 6 ft. new Carroll-Jamieson, quick change
15 in. x 6 ft. new Sidney, D.B.G., quick change, swing 17 in.
16 in. x 6 ft. new Canedy-Otto
16 in. x 10 ft. new Carroll, D.B.G., quick change
16 in. x 24 ft. new Rahn-Larmon, double back geared, quick change
17 in. x 8 ft. new Sidney, D.B.G., quick change, swing 19 in.
17 in. x 10 ft. new Sidney, D.B.G., quick change, swing 19 in.
17 in. x 8 ft. National, quick change
18 in. x 8 ft. new Canedy-Otto
19 in. x 8 ft. LeBlond, D.B.G., quick change
19 in. x 8 ft. new Sidney, D.B.G., quick change, swing 21 in.
21 in. x 8 ft. LeBlond heavy duty, D.B.G., quick change
21 in. x 10 ft. LeBlond heavy duty, D.B.G., quick change
25 in. x 14 ft. new Sidney, D.B.G., quick change, swing 27 in.
26 in. x 10 ft. Bridgeford, D.B.G., quick change
24 in. x 48 in. x 16 ft. new Rahn-Larmon Extension Bed Gap

PRESSES

No. 3 Bliss, double crank
P-2 Ferracute
No. 138 Max Ams Inclinable
No. 130 new Max Ams Inclinable
No. 64 new Consolidated
No. 65 new Consolidated

CAR WHEEL LATHES

42 in. Niles open type, motor driven
42 in. Pond center driven, motor driven

VERTICAL BORING MILLS

60 in. Bullard, two heads, arranged for motor drive
60 in. Niles, two heads, belt drive
42 in. Putnam car wheel boring machine

HORIZONTAL BORING MILLS

3 in. Bar Barnes

PLANERS

48 in. x 48 in. x 12 ft. Hamilton, four heads, motor drive
40 in. x 40 in. x 10 ft. Powell, two heads
36 in. x 36 in. x 8 ft. Gray, two heads
26 in. x 26 in. x 8 ft. Pond, one head
18 in. x 18 in. x 3 ft. Wheeler, one head

SHAPERS

7 in. new Rhodes
14 in. Smith & Mills
16 in. new Steptoe, back geared
20 in. new Steptoe, back geared
20 in. Gould & Eberhardt, back geared
24 in. new Steptoe, back geared

MILLERS

No. 4 Brown & Sharpe, plain
No. 3-A Garvin, Universal
No. 3 Becker, vertical
No. 1½ American, plain with dividing heads
No. 0 new Steptoe, hand

GRINDERS

No. 1 Fraser, universal, new
No. 1 Landis, internal
No. 1 Grand Rapids, new, cutter and reamer

RADIAL DRILLS

6 ft. Western, universal, motor drive
60 in. Bickford Plain, gear box type
48 in. Fosdick, Plain, gear box type
42 in. Canedy-Otto Post type

DRILL PRESSES

20 in. Barnes, all geared
20 in. new Champion, back geared, power feed
20 in. new Superior, back geared, power feed
24 in. new Superior, back geared, power feed
25 in. new Superior, sliding head
28 in. new Superior, sliding head
32 in. new Superior, sliding head
36 in. new Superior, sliding head
36 in. Bement Goose Neck

HAMMERS

400 lb. single frame steam
100 lb. new Little Giant
50 lb. new Little Giant
25 lb. new Little Giant

PUNCHES AND SHEARS

18 in. throat double end Punch
No. 000 Hilles & Jones single end Punch and Shear
No. 52 Beloit Punch and Shear
No. 4 Beloit Splitting Shear
No. 7-B new Doty Shear

MISCELLANEOUS

1 in. Acme BoltCutter
36 in. Gould & Eberhardt Gear Cutter
30 Ton W. & S. Hydraulic Press

TURRET LATHES

No. 5 B. & O. back geared, friction head
2 in. x 24 in. Jones & Lamson, geared head
No. 1 Bardons & Oliver, wire feed
No. 52 new National Acme Automatic

WRITE TOOMEY FIRST

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U. S. GOVERNMENT WAREHOUSE, NO. 193, REMINGTON ARMS (U. M. C. PLANT)
SEAVIEW AVE., BRIDGEPORT, CONN.

Monday and Tuesday, January 5 and 6, 1920, at 10 A. M.

MISCELLANEOUS MATERIAL

BOLTS (Assorted Sizes)
BRONZE (Scrap)
CONCRETE TIE RODS
ENVELOPES
MANILA PAPER
MACHINE STEEL (Miscellaneous)
NUTS (Assorted Sizes).
OILS (Lubricating)
OILS (Cutting)
PAINTS
PIPE FITTINGS
STATIONERY
SHIPPING TAGS
SCREWS (Assorted Sizes
WASHERS (Assorted Sizes)
WIRE NETTING
TERRA COTTA PIPE

MISCELLANEOUS FACTORY EQUIPMENT, Including following various types of machinery, etc.

ACETYLENE GENERATORS
BLOWERS
DRILLS
FURNACES
GRINDERS
HANGERS
LATHES
MILLING MACHINES
POWER PRESSES
PULLEYS
PROFILERS
SAWS
SAND BLAST FURNACES
SHAVING MACHINES
SCREW MACHINES
SHEARS
SODA KETTLES
TAPPERS
TUMBLING BARRELS
TURRET LATHES
SHAFTING

In addition to which the following factory furnishings:

BENCHES (Work)
BOXES (Wooden and Steel)
CHAIRS
DRAFTING TABLES
HOSPITAL EQUIPMENT
STEEL CLOTHES LOCKERS
RESTAURANT EQUIPMENT
TABLES

There will also be offered for sale the following Automobiles and Trucks

TWO OVERLAND FIVE PASSENGER TOURING CARS, MODEL 1916.
TWO FIVE-TON (Dump Body) PIERCE ARROW TRUCKS, MODEL 1916.
ONE ONE-TON (Band Body) MAXWELL TRUCK, MODEL 1918.

ALL PROPERTY SOLD F. O. B. CARS, BRIDGEPORT, CONN., OR PLANT AT WHICH PROPERTY IS LOCATED
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USED MACHINE TOOLS

We have facilities for overhauling used tools and it is our aim to offer only reliable equipment.

No. 2 Beamen & Smith horizontal Boring Mill, 4 in. dia. spindle, 6½-hp. Reliance motor and 2-hp. head elevating motor.
No. ½-1 sp. Avey bench drills (24).
42-in. Cincinnati-Bickford sliding head drill, BG, PF.
3-ft. Gang plain radial drill, tapping att., plain table.
No. 1 Bickford plain radial drill, arm extended to 5-ft. tapping, gearbox belt drive, box table.
No. 0 Bickford plain radial drill, cone drive, swinging table.
No. 13-6 sp. Pratt & Whitney drill.
6 x 48 P. & W. plain grinder.
No. 11 Rivett oscillating grinder.
No. 16 Blanchard vertical surface grinder, direct motor drive.
No. 3 Walker surface grinder, mag. chuck.
24 x 8 Gould & Eberhardt spur and bevel gear cutter.
16 x 6 Hendey geared head lathe, CR, PCF, SR, hollow spindle.
24-in. Gisholt turret lathe, 6½ in.
8 x 8 Prentice Bros. geared head lathe, CR, PCF, oil pan, chuck fitted.
22 x 8 Schumacher Boye lathe, CR, PCF.
44 x 16 Putnam lathe, single back gears, CR, PCF, SR, 4-in. raising blocks.
No. 14 A Garvin plain miller (7).
No. 14 Garvin plain miller (4).
No. 15 Garvin plain miller.
No. 2 Owen plain miller complete.
No. 1½ B. & S. plan miller, B. G. Vise.
No. 3 Becker vertical miller, belt drive, power feed to table.
36 x 36 x 8 Pond planer.
24 x 24 x 6 Putnam planer.
24 x 24 x 6 Flather planer.
30 x 30 x 8 Woodward & Powell planer, two heads.
No. 11 Higley cold saw.
No. 2 Foster wire feed screw machine (3).
2 x 24 K. & L. flat turret lathe, cone drive (3).
20-in. J. & L. geared head turret lathe, 4½-in. hollow spindle.
4¼-in. Cleveland auto. screw machine (2).
No. 3 Acme geared head flat turret lathe, bar and chucking equipment, taper.

HENRY PRENTISS & COMPANY
INCORPORATED
149 Broadway, New York City
BOSTON BUFFALO Warehouse: JERSEY CITY SYRACUSE ROCHESTER

Rebuilt Guaranteed Machinery
FOR IMMEDIATE DELIVERY

AUTOMATICS
1—½ in. Hartford Automatic.
1—7/16 in. Hartford Automatic.
1—1 ½ in. x 17 in. Hartford Automatic.
4—1¼ in. 4-spindle Gridley Automatics

DRILLS
1—20 in. Gibson S. H. l. f. Drill Press.
1—12 in. swing 2-spl. Sensitive Drill.
1—⅜ in. 3-spl. Sensitive Drill.
2—5-spl. Allen Sensitive Drills, 29/32 in. cap.
2—4-spl. Allen Sensitive Drills, 29/32 in. cap.
2—3-spl. Allen Sensitive Drills, 29/32 in. cap.
1—4-spl. Sigourney Sensitive Drill. ½ in. cap.
1—2-spl. Barnes Drill, B. G. p. f.
1—4-spl. Barnes Drill, G.P.F. No. 4 Morse taper.
1—28 in. Aurora B.G. P.F. S.H. with tapping attachment.

LATHES
1—14 x 6 Lathe and Morse 4 s.c., s.b.g., L.C.G.
2—16 x 6 Reed Plain Turning Lathes (not screw cutting) 5 s.c., s.b.g.
1—16 x 8 Goddard 5 s.c., s.b.g., L.C.G.
3—20 x 8 American 3 s.c., d.b.g., Q.C.
1—20 x 8 Flather 3 s.c., s.b.g., L.C.G.
1—20 x 10 Bridgeport 4 s.c.,s. b.g., L.C.H.

MILLING MACHINES
1—Whitney Hand Miller.
1—No. OB Fox Hand and Power Feed Miller.
1—13 x 50 Hendey Lincoln Miller.
1—26 x 10 Hendey Lincoln Miller.
2—No. 2 Pratt & Whitney Lincoln Millers.
1—Type A 16 in. Briggs High Duty Miller.
1—10 in. Pratt & Whitney Automatic Miller.
3—Taylor & Fenn Vertical Millers.
3—12 in. Pratt & Whitney Auto. Millers.

SCREW MACHINES AND TURRET LATHES
1—No. 22 Garvin Plain Hd. Turret Lathe.
1—4 in. Davis Turret Boring and Forming Lathe.
1—1½ in. x 9 in. Acme Hand Screw Machine.
2—20 in. swing Acme Flat Turret Lathes g.h., s.p.d., 2¼ in. hole spindle.
1—2½ in. x 26 in. Pratt & Whitney Universal Turret Lathe.
10—1½ in. x 18 in. Pratt & Whitney Hand Screw Machines.

MISCELLANEOUS
1—No. 4 4 in. cap. Loew-Victor Pipe Machine.
1—24 x 24 x 16 ft. Fitchburg Planer.
1—16 in. Niles b.g. C. Shaper.
1—No. 2 Whiton Auto. Gear Cutter, 36 in. cap.
1—36 in. x 9 in. Gould & Eberhardt Gear Cutter.
1—50 lb. Mayer Power Hammer.
1—100 lb. Drop Hammer.
1—No. 14 Higley Cold Saw.
1—No. 0 LaPointe Broacher.
1—No. 3-B LaPointe Broacher.

BADGER-PACKARD MACHINERY CO.
133-139 WEST WATER STREET, MILWAUKEE, WIS.

Partial List—USED MACHINERY—In Cleveland Stock

BORING MILLS

1—72-in. Betts, 2 Heads.
1—100 Betts Tire Mill, 3 Heads.

DRILLS

1—5-ft. Bickford Universal, gear box drive, radial.
1—4-ft. Bickford Plain Radial, gear box drive.
2—26-in. Aurora Sliding Head.
1—2½-ft. Fosdick Radial with 3-hp. Var. Speed D.C. Motor.
1—3-ft. Bickford Radial, with 3-hp. Var. Speed D.C. Motor.
1—5-ft. Fosdick Radial with 7½-hp. Var. Speed D.C. Motor.
1—6-ft. Prentice Radial with 7½-hp. D.C. Motor.

MILLING MACHINES

3—Type "A" Briggs.
3—No. 15 Garvin Plain.
2—10-in. Pratt & Whitney Automatics.

PISTON RING MACHINES

3—Gridleys (Plain).
2—Gridleys (Eccentric).

LATHES

20—8-in. x 60-in. Fitchburg "Lo-Swing."
12—9-in. x 12-in. Sundstrand.
1—16-in. x 8-ft. Draper Quick Change D.B.G. 5-step cone.
1—16-in. x 8-ft. Greaves Klusman.
1—16-in. x 8-ft. Monarch 4-step Cone.
1—18-in. x 19-ft. Schumaker, D.B.G. Quick Change 3-step Cone.
1—22-in. x 4-ft. Niles Heavy 4-step Cone.
1—30-in. x 14-ft. Pond Heavy 5-step Cone.

SHAPERS

1—16-in. Ohio (Cone).

BROACHING MACHINE

1—No. 0 J. N. Lapointe.

THREAD MILLER

No. 10 Hole Hog.
No. 18 Ohio Cone.

GEAR CUTTER

2—36-in. x 9-in. Gould & Eberhardt Horizontal type.
1—No. 2 Whiton automatic.

GRINDERS

1—No. 3 Brown & Sharpe Universal.
10—No. 16 Bryant Internal.
3—No. 1½ Cincinnati Cutter and tool.
4—4-spindle Foot-Burt valve.
1—10 x 24-in. Horton single purpose machine.
1—Garrigue Ring.
1—14 x 72 Norton.
1—12-in. x 96-in. Landis Universal.

HAMMERS

3—No. 3-A High-Speed Rivetting, on Pedestal.
1—No. 35 Williams, White & Co., Power Tire Welding.

TURRET LATHES AND SCREW MACHINES

8—2½-in. x 26-in. Acme Flat Plain.
10—3¼-in. x 36-in. Flat Plain.
1—2-in. Cleveland Acme Flat Plain.
1—No. 7 Bardons & Oliver.
1—1-in. x 7-in. Cincinnati Acme.
6—21-in. Gisholts.
6—24-in. Gisholts.
1—13-in. Gisholt.

"WE REBUILD THE MACHINE—WE ALSO PURCHASE MODERN TOOLS"

THE MOTCH & MERRYWEATHER MACHINERY CO.

707 Lakeside Avenue, Cleveland, Ohio

BRANCHES: CINCINNATI DETROIT PITTSBURGH

LATHES

60-in. x 20-ft. Fifield.....$3500
Heavy type, driven by 10 H.P. variable speed motor; full equipment. Price includes motor and electrical controls.

21-in. x 10-ft. Le Blond.....$850
Quick change gears, double back geared, compound rest; splendid operating condition.

20-in. x 6-ft. American.....$1000
Quick change gears, taper attachment; just like new.

18-in. x 10-ft. Smith Cannery.....$850
Quick change gears, double back geared, taper attachment; has had six months' use, and that with care.

18-in. x 8-ft. Lodge & Shipley.....$750
Quick change gears, taper attachment, compound rest; splendid condition.

18-in. x 8-ft. Greaves Klusman.....$900
Quick change gears, compound rest; heavy type, in splendid condition; double back geared.

18-in. x 8-ft. F. E. Reed.....$525
Compound rest, all change gears, pan bed; splendid condition.

16-in. x 8-ft. Hendey.....$750
Quick change gears, taper attachments, relieving attachment, pan bed, compound rest.

14-in. x 6-ft. Lodge & Shipley.....$650
Quick change gears, taper attachment, pan bed.

14-in. x 5-ft. Lodge & Shipley.....$600
Quick change gears, taper attachment, pan bed.

TURRET LATHES and AUTOMATICS

3-in. x 36-in. Jones & Lamson.....$1000
Geared head type; fine condition.

Pratt & Whitney Turret Lathe.....$850
3-in. capacity; splendid condition.

No. 56 National Acme.....$2500
2½-in. capacity, very latest type four-spindle machine; in use one month.

PLANERS

60-in. x 60-in. x 13-ft. Pond.....$5000
Four swivel heads, two on rail; two side heads, heavy type, equipped with motors—one 20 H.P., one 7½ H.P. Price includes motors. Planer is in splendid shape. A big bargain.

50-in. x 36-in. x 14-ft. Pond.....$2750
Three heads, two on rail, one side head; heavy modern type machine; condition exceptionally good. At the price the Planer is extremely cheap.

30-in. x 30-in. x 10-ft. Cincinnati.....$2500
One head, box bed, latest type, just like new.

2—17-in. x 17-in. Whitcomb.....$450 each
Crank type Planers, like new.

GRINDERS

No. 4 Cincinnati Universal.....$2500
Capacity 16 in. x 66 in., complete with chucks, internal grinding attachment, etc.; like new.

No. 1 Bath Universal.....$850
Capacity 10 in. x 24 in.; machine complete with full universal equipment; condition is splendid; used in toolroom carefully.

2—W. Sellers Tool.....$350 each
Late type, with longitudinal and cross feeds, swivel head, pump, etc.; very good condition.

2—Bryant Internal.....$450 each
Machines just like new.

SHAPERS

36-in. Morton Draw Cut.....$850
Complete with vise and countershaft; first class condition.

16-in. Queen City.....$600
Cone drive, with vise and countershaft; splendid condition.

16-in. Smith & Mills.....$600
With vise and countershaft; feeds and speeds through gear box.

MISCELLANEOUS

2—2 Spindle Leland Gifford Profilers.....$500 each

2—2 Spindle Reed-Prentice Profilers.....$500 each

30-in. Stoll Geared Squaring Shear.....$600
Heavy type Shear; ¼ in. capacity.

24-in. Sibley Sliding Head Drill.....$450

No. 5 Leffler Arch Geared Press.....$1000

7—80,000 pound Riehle Testing Presses.....$750 each

Above machines are as near new both in condition and appearance as ever offered. We have 600 machines in stock—write us your wants.

NEW JERSEY MACHINERY EXCHANGE

21-23 MECHANIC STREET, NEWARK, N. J.

REBUILT MACHINE TOOLS IN STOCK

BORING MILLS

1—10-ft. Niles, two heads on the rail.
3—7-ft. Betts Vert.; double housings; two swivel heads on the rail.
1—5-ft. Bullard Vert.; double housings; two swivel heads on the rail.
1—Berman & Smith Horizontal.
1—10-ft. Niles, double housings; two heads on the rail.
1—44-in. Rogers 2-swivel heads on the rail.
1—30-in. Bullard, turret head.

TURRET LATHES

3—24-in. Gisholt, 6¼-in. hollow spindle, latest design.
4—21-in. Gisholt, 3½-in. hollow spindle, latest design.
3—2-in. x 24-in. Jones & Lamson Flat, single pulley drive, geared sliding head.
1—3 in. x 36-in. Jones & Lamson Flat, single pulley drive, geared sliding head.

PLANERS

1—48-in. x 48-in. x 12 ft. Niles; two heads on rail, double housings, heavy type.
1—36-in. x 36-in. x 12-ft. Cincinnati; two heads on rail, one side head, motor drive.
1—30-in. x 30-in. x 8-ft. Pond, two heads on rail.
1—24-in. x 24-in. x 6-ft. Rochester, one swivel head.
1—14-in. x 25-in. Pedrick & Ayer, Open-side or Shaper.

SHAPERS AND SLOTTERS

1—26-in. Kelly DBG., Crank; latest design.
1—30-in. Morton Draw-Cut Shaper.
3—10-in. Bement-Niles Slotters, 24-in. rotary table.
1—15-in. Smith & Mills.

DRILLS

1—5-ft. Dreses Full Univ. Radial.
1—5-ft. Baush Heavy Duty Plain Radial, gear feeds.
1—4-ft. Mueller Plain Radial.
1—3½-ft. Prentice Plain Radial.

LATHES

1—68 x 31 Fifield TG, Engine Lathe, 45 HP., D.C. motor drive.
1—50 x 20 Fifield, TG.
1—36 x 29 Moore, TG.
1—48-in. x 18-ft. Fifield TG, Engine, 10-ft. 6-in. centers.
1—48 x 18 Bement, TG.
10—32-in. x 14-ft. Pittsburgh TG, heavy duty tools.
1—26-in. x 16-ft. Bridgeport DBG, Engine.
5—26-in. x 12-ft. Bridgeport Double BG, Engine, QCG.
2—26-in. x 10-ft. Bridgeport DBG, Engine, QCG.
3—26-in. x 11-ft. Wickes DBG, Engine, QCG, 5-ft. centers.
6—22-in. x 10-ft. Davis DBG, Engine QCG, 57-in. centers.
1—20-in. x 14-ft. Leblond Engine, 9-ft. 6-in. centers.
1—20-in. x 10-ft. Lodge & Shipley Engine, QCG.
1—20-in. x 10-ft. Hendey, QCG.

MILLING MACHINES

1—No. 3 Kempsmith Univ., full equipment, new.
1—No. 3 Leblond Plain, QCF, dividing heads and vise.
1—No. 5 Becker Vert., no rotary table.
1—No. 1½ Cincinnati Universal.
1—Ingersoll Slab, 5-ft. platen, 22 in. between housings.

MISCELLANEOUS

1—No. 3 Landis Univ. Grinder, 12 in. x 42 in.
1—Pels I-Beam Shear; capacity, 15-in. I-Beam.
1—Newton Cold Saw, 42-in. blade.
1—S. & C. Saw, 31-in. blade.
1—3-in. Hurlbut & Rogers Cut-off Mach., 3-in. cap.

C. W. PRICHARD COMPANY, 50 Church Street, New York City, N. Y.
Telephone: Cortlandt 6044 Warehouse, Jersey City, N. J.

USED MACHINERY

LATHES

2—10-in. x 5-ft. Pratt & Whitney Toolmakers' Lathes with Compound Elevating Rest, Taper Attachment, Drawing-in Attachment, Oil Pan.
13-in. x 6-ft. Pratt & Whitney Lathe with Elevating Rest, Taper Attachment.
6—14-in. x 6-ft. Bradford Standard Engine Lathes with Compound Rest.
3—14-in. x 6-ft. Bradford Standard Engine Lathes with Taper Attachment and Compound Rest.
14-in. x 6-ft. Blaisdell Lathe, Single Back Gear, Loose Change Gear, Rise and Fall Rest.
15-in. x 6-ft. Miami Valley Engine Lathe with Compound Rest.
16-in. x 6-ft. Lodge & Shipley Lathe with Compound Rest, Single Back Gear, Quick Change Gear, Taper Attachment.
16-in. x 8-ft. Reed Lathe with Elevating Rest.
16-ft. x 8-ft. Hendey Lathe, Motor Driven, equipped with 220-volt, 3-phase, 60-cycle motor.
17-in. x 6-ft. LeBlond Heavy Duty Manufacturing Lathe with turret on carriage.
19-in. x 10-ft. LeBlond Heavy Duty Manufacturing Lathe with Plain Rest, Longitudinal Stops, Taper Attachment.
20-in. x 12-ft. LeBlond Lathe, Double Back Gear, Compound and Swing Rests.
20-in. x 14-ft. Monarch Standard Engine Lathe with Compound Rest.
24-in. x 12-ft. New Haven Lathe with Compound Rest.
24-in. x 14-ft. Schumacher & Boye Lathe, D.B.G., Q.C.G.
26-in. x 14-ft. Pratt & Whitney Lathe with Swivel Rest, Taper Attachment.
36-in. x 20-ft. New Haven Triple Geared Lathe, Quick Change Gear, Compound Rest.

PLANERS AND SHAPERS

12-in. Cincinnati Crank Planer.
20-in. Standard Back Geared Ohio Crank Shaper.
24-in. Smith & Silk Shaper.
28-in. Ohio Shaper.

DRILLS

No. ½ Avey Sensitive Bench Drill.
Three-spindle 16-in. Sipp High-Speed Ball-Bearing Drill.
14-in. Four-spindle Cleveland High-Speed Ball-Bearing Drill with Tapping Attachment on each spindle.
No. 11 Eight-spindle NATCO Multiple-Spindle Drill with 12-in. circular head.
21-in. Weigel Drill, Back Gear, Power Feed, Automatic Stop.
4-ft. Arm Fosdick & Holloway Plain Radial Drill.
6-ft. Arm Niles-Bement-Pond Universal Radial Drill with 220-volt D.C. Motor.

GRINDERS

No. 1 Cincinnati Universal Tool and Cutter Grinder.
No. 1 Norton Universal Tool and Cutter Grinder.
10 x 20 Acme Universal Tool and Cutter Grinder.
16-in. Cleveland Hole Grinder.
22 x 84 Pratt & Whitney Heavy Vertical Surface Grinder driven with 40-H.P. 3-phase, 60-cycle, 220-volt Motor.

MILLING MACHINES

2—Waltham Thread Milling Machines.
No. 1½ Kearney & Trecker Double Over-Arm Universal Milling Machine.
No. 2-H Becker Vertical Milling Machine with Rotary.

GEAR CUTTING, HOBBING AND SHAPING MACHINES

No. 1 Schuchardt & Schutte Spur and Worm Gear Hobbing Machine.
No. 3 Brown & Sharpe Spur Gear Cutting Machine.
6—Fellows Gear Shapers.

SCREW MACHINES AND TURRET LATHES

7—2¼-in. Single-spindle Gridley Automatic Screw Machines.

MISCELLANEOUS

No. 2 Davis Keyseater.
No. 5 Merrell Pipe Machine.
Houghton & Richards Band Saw Machine.
4-in. Hurlbut-Rogers Cut-off Machine.
2½-in. Bar Niles Cone Type Horizontal Boring Machine.
4 x 80 Pratt & Whitney Thread Miller.
40-lb. Bradley Helve Hammer.
Electromobile Truck, carrying capactiy 3000 lb., pulling capacity 10,000 lb., two four-wheel wagon trailers and charging outfit.
Type 3-V.S.-23 NATIONAL BRAKE & Electric Co.'s Motor Driven Air Compressor, having a piston displacement of 300 cu.ft. per minute against 90-lb. pressure; including 54-H.P. Allis-Chalmers 3-phase, 60-cycle, 220-volt A.C. motor. Type H.B. Control, comprising automatic governor, unloader and water valve; all mounted on common bedplate, making complete self-contained unit.

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CLEVELAND *Machinery Department* OHIO, U. S. A.

SPECIALS

2—600-lb. Billings & Spencer Board Drop Hammer.
5—800-lob. Billings & Spencer Board Drop Hammer.
1—36-in. and 42-in. Bullard New Era Type Boring Mills, complete and in original crates.
1—No. 59 TOLEDO Straight Sided Press, with tie-rod frame. Stroke 12 in., Distance between uprights 40 in., Double back geared, friction clutch.
1—DGG-55 FERRACUTE Press, 20-in. stroke; DGG-56 FERRACUTE Press, 20-in. stroke.
D-102 FERRACUTE Press, 16-in., 25-in., 30-in. and 42-in. stroke.
Eg-6 FERRACUTE Press, 2-in. stroke; EG-56 FERRACUTE 2½-in. stroke.
E-57 FERRACUTE Press, 2-in. stroke.
1—72-in. BULLARD MILL, two saw heads.
1—38-in. BULLARD Boring Mill, one turret, one plain head, thread cutting.
1—15-ft. HORIZONTAL Boring Mill, Floor type with 10-in. bar.
1—12-ft. NILES Boring & Turning Mill, two swivel heads, table 68 in. diameter.
1—No. 3B OWEN Plain Miller, Vertical Attachment.
4—No. 4—CINCINNATI Universal Millers, Vertical Head.
4—No. 3 KEMPSMITH Plain Millers, complete.
1—No. 3 CINCINNATI Vertical Miller, sliding head.
2—No. 4 BECKER Vertical Millers.
2—No. 2 CINCINNATI Vertical Millers, sliding head, complete.
1—6-ft. PRENTICE Radial Drill, Single Pulley Drive.
1—5-ft. PRENTICE Radial Drill, Single Pulley Drive.
1—4-ft. 6-in. BICKFORD Radial, complete.
1—24-in. x 24-in. x 12-ft. POND Planer.
4—NEW 42-in. x 42-in. x 12-ft. OPENSIDE Planer, two heads, complete.
7—2¼-in. GRIDLEY four-spindle Automatics, complete.
3—1¼-in. GRIDLEY four-spindle Automatics, complete.
1—No. 0 BROWN-SHARPE Auto Screw Machine, 6-hole turret.
1—No. C COVINGTON Gillotine Shear.
1—NEW 56-ft. Single Crank, double geared press, 8-in. stroke.
1—36-in. x 16-ft. NILES Geared Head, QCG, Motor Drive Lathe.
1—26-in. x 10-ft. LODGE & SHIPLEY Lathe, late type.
1—20-in. x 8-ft. AMERICAN High Duty Quick Change Gear Lathe.
1—40-in. x 24-ft. FIFIELD Lathe, Triple Geared.
1—40-in. x 18-ft. FIFIELD Lathe, Triple Geared.
3—18-in. x 10-ft. HENDEY Lathes, Taper, Pan, Geared Head, Relieving Attachment.
3—18-in. x 10-ft. HENDEY Lathes, Taper, Pan, Geared Head.
1—18-in. x 10-ft. LEBLONDE Lathe.
1—27-in. x 10-ft. AMERICAN Geared Head Lathe, single pulley, quick change.
4—24-in. BEMENT Crank Slotters, complete.
3—18-in. DILL Slotters complete, with motor.
3—12-in. DILL Slotters complete, with motor.
1—20-in. CINCINNATI Shaper, complete.
2—16-in. CINCINNATI Shapers, complete.
1—No. 30 12-Spindle BAUSCH Drill, complete.
3—24-in. AURORA Sliding Head Drill, complete.
1—26-in. BARNES Upright Drill, complete.
1—36-in. CINCINNATI Sliding Head Drill, complete.
3—No. 60 Heald Cylindrical Grinders.

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Only Part of Complete Stock.
Prices Especially Attractive.
Every Machine Our Own.
Immediate Deliveries. Fully Guaranteed.

LATHES

1—HENDEY 16-in. x 8-ft. Geared Head, tapered, latest types, one relieving attach.
1—25-in. x 14-ft. LE BLOND, latest, Q.C.G..
1—25-in. x 12-ft. LE BLOND, latest, Q.C.G.
3—25-in. x 10-ft. LE BLOND, latest, Q.C.G.
1—20-in. x 6-ft. REED-PRENTICE Q.C.G., like new, pan bed, chuck.
1—18-in. x 8-ft. GREAVES-KLUSMAN, Q.C. feed.
1—16-in. x 8-ft. BARNES, with chuck, latest.
1—12-in. x 5-ft. DAVIS, close-coupled, Q.C.G.
45—No. 606 RIVETT bench precision, like new.

MILLING MACHINES

1—No. 2 Vertical, B. & S., late type.
2—No. 1½ Plain, CINCINNATI, latest.
1—No. 1 Plain, KEMPSMITH, latest type.
1—No. 2 Plain, B. & S., divid. hds.
1—No. 2 P. & W. Hand, latest.
9—No. 6 WHITNEY Hand, arbors, etc.

SHAPERS

1—28-in. AMERICAN, back geared.
1—21-in. SMITH & MILLS, B.G., latest.
1—17-in. SMITH & MILLS, B.G. latest.
1—16-in. ROCKFORD B.G., latest.

DRILLS

1—4-ft. CARLTON Plain, t.a., NEW.
1—40-in. NEW HAVEN B.G., slid. head.
50—HIGH SPEED, 1 to 6 spindles, HENRY & WRIGHT, LELAND GIFFORD, ALLEN.

GRINDERS

1—No. 1 BROWN & SHARPE, 99% new, Univ.
1—No. 1 NORTON Universal, 99% new.
1—No. 2 B. & S. auto. SURFACE, mag. ck.
1—No. 2 B. & S. Universal, internal att.
1—10-in. x 50-in. NORTON Plain, cylindrical.

POWER PRESSES

1—No. 108 Z. & H. Double Crank.
1—No. 20-B BLISS, latest, 1918 blt.
2—HORNING, No. 12 Toledo, 3¾-in. stroke.
2—STILES No. 2-A Horning, 3-in. st.
3—No. 3 STILES, geared, late type.
1—No. 4 STILES, geared.
1—No. 4 STILES Plain Back Wheel.
1—FERRACUTE No. dg-2, geared, 5-in. st.
5—No. 2 BAUROTH Inclinable.

SCREW MACHINES

1—No. 56 AUTOMATIC, 4 sp., Nat'l Acme.
1—3 x 36 J. & L. Turret, latest type.
10—No. 5 FOSTER Back Geared, compl.
2—No. 3 FOSTER Plain, latest type.

MISCELLANEOUS

GEAR CUTTER—72-in. Spur, G. & E., cap. 1 d.p.
STEAM HAMMER—600-lb. McDOUGALL POTTER.
PLANER—POND 20 x 22 x 5 complete
PLANER—COULTER open side.
CORRUGATING ROLLER—OHL 50-in.
PROFILERS—3 LELAND-GIFFORD 2-spindle, latest type.

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LATHES

24-in. x 48-in. x 14-ft. Harrington Extension Gap Lathe, raising blocks (swing 64-in., with taper attachment, motor driven).
32-in. x 12-ft. Heavy Duty Pittsburgh, Q.C.G.
31-in. x 14-ft. Niles.
27-in. x 12-ft. Heavy Duty Bridgeford, Q.C.G. (2).
26-in. x 11-ft. Wickes, Q.C.G.
28-in. x 10-ft. Niles, Q.C.G. (2).
25-in. x 14-ft. Le Blonde.
23-in. x 10-ft. Davis, D.B.G., Q.C.G.
22-in. x 8-ft. Hamilton, D.B.G.
22-in. x 8-ft. Greaves & Klusman.
21-in. x 8-ft. Le Blonde (3).
20-in. x 8-ft. 6-in. Walcott, D.B.G., Q.C.G (2)
19-in. x 10-ft. Draper, patent head.
18-in. x 6-ft. to 8-ft. Lathes (6).
16-in. Lathes (10).
14-in. Lathes (19).
And many others.

TURRET LATHES

3 x 36-in. Jones & Lamson.
7 x 14-in. Potter & Johnson semi-auto (2).
No. 4 Warner & Swasey, Fox attachment.
2½-in. Windsor Turret with Fox attachment.
No. 22½ Garvin Monitor.
No. 3 Bardons & Oliver (2).
1½-in. H.S., 11-in. Swing Foster.
And many others.

MILLING MACHINES

No. 6 Becker Vert., table 18 x 60-in.
36-in x 8-ft. Ingersoll, horizontal slab.
No. 5 Cincinnati, table 9½ x 50½-in.
No. 15 Garvin, table 12 x 41½-in.
No. 15 Garvin, table 12 x 42-in.
No. 3H Le Blonde Univ., heavy duty.
No. 3 Cincinnati, table 12 x 46½-in.
No. 3 Becker Brainard, table 12 x 40-in.
No. 2 Cincinnati Univ., table 8 x 35-in.
Brown & Sharpe, 4 x 28-in., Univ. table (2)
No. 3 Garvin Hand, horizontal.
Whitney Hand.
And many others.

DRILL PRESSES

40-in. Barnes Horiz. Radials (2).
36-in. Bickford Radials, cir. base, M.D. (2).
24-in. Barnes, geared head.
20-in. Barnes, geared head.
12-in. 6-Spindle Allen Sens. (2).
12-in. 4-Spindle Allen Sens. (2).
12-in. Allen Bench.
Plain Drills, all sizes.
Drill Presses, assorted sizes.

BOILERMAKERS' MACHINERY

100-150-ton Wood Hydraulic Flanging and Forming Press.
Large Lot of Miscellaneous Ironworkers' Tools, Punches, etc.

PUNCH PRESSES

Punch Presses, assorted sizes (28).

HAMMERS

800-lb. Billings & Spencer Board Drop.
100-lb. Bradley Helve.
100-lb. Merrill Upright.
60-lb. Bradley Helve.
60-lb. Bellefonte Upright (3).

KEYSEATERS

24-in. Stroke Baker Brothers.
18-in. Stroke Morton (2).
Double Head Robinson Carr, B.G., 22-in.; swings 7-ft. centres.

MISCELLANEOUS

6-ft. Arm Univ. Swinging Grinders, 1½-in. spindles (2).
12 x 25-in. Bath Univ. Tool and Cutter Grinder.
No. 17 Besley Grinder.
Rockford Broaching Machine, 16-in. stroke.
Spindle Newton Horiz. Boring Mill (2).
32-in. Newton Car Wheel Boring Mill.
2-in. Newton Bolt Cutter, Q.C.G.
1¼-in. National Bolt Cutter.
10-in. Stroke Sellers Slotter.

In addition to the above, I have a large assortment of Boilers, Engines and Machine Tools and General Machinery. Let me have a list of your wants. Correspondence solicited.

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BIG PLANER

Low Price for a Quick Offer

60 in. x 60 in. x 13 ft. Betts planer, rebuilt; two heads; ready stock delivery in Cleveland. Write for price.

24 in. x 10 ft. **Greaves-Klusman,** old style belt feed, friction back gear, geared head stock, turret on bed, with power feed, compound rest and countershaft. Price F. O. B. New York..... $1350

1½ **Pratt & Whitney Automatic Screw Machine** with large equipment. Price F. O. B. New York City..... 250

4 ft. **Reed-Prentice** Standard **Pattern Radial Drill,** gear box drive, plain box table. Price F. O. B. New York..... $1600

60 in. x 48 in. x 16 ft. **Betts Planers,** 2 heads on cross rail..... $3000

38 in. x 38 in. x 20 ft. **Pond Planer,** 2 heads on cross rail with countershaft $3500

38 in. x 38 in. x 24 ft., same as above, F. O. B. Worcester, Mass. $3600

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THE FAIRBANKS COMPANY

416-422 Broome St., New York, N. Y.

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For Prompt Shipment

DRILLING MACHINES

1—30 in. Hamilton Plain.
1—24 in. Hoeffer Sliding Head, Tapping Attachment.
1—No. 4 Baush 16-spindle Multiple Drill.

GRINDERS

1—No. 1 Brown & Sharpe Universal.
1—Hartford Surface Grinder, all automatic feeds, complete.
2—Walker Surface Grinders, complete with Magnetic Chucks.

LATHES

1—16 in. x 6 ft. Davis C.B.—P.C.F. complete.
1—16 in. x 8 ft. Van Wyck, C.B.—P.C.F complete.
3—18 in. x 8 ft. Greaves Klusman complete.
1—19 in. x 10 ft. LeBlond complete, Taper Attachment.
1—25 in. x 10 ft. Hamilton Quick Change, complete.
1—26 in. x 16 ft. Blaisdell complete.

MILLING MACHINES

1—No. 2 Kempsmith Universal Milling Machine, complete with dividing heads, swivel vise, vertical attachment, radius attachment and slotting attachment.
1—No. 1 Hendy-Norton Universal complete with Dividing Head Swivel Vise.
1—No. 20 Oesterlein Plain Miller complete.
1—No. 1 Dow Plain Miller complete.

POWER PRESSES

1—No. 6 New Rockford Straight Side.

PUNCHES

1—No. 2 Hilles & Jones Horizontal Punch, 8 in. throat, capacity 1 in. in ¾ in.
1—No. 36-C Cleveland Single End Punch, 36 in. throat, capacity 1 in. in ¾ in.

SHAPERS

1—16 in. Ohio Back Geared.
1—20 in. Ohio Back Geared Shaper.

GEAR CUTTERS

1—24 in. Becker-Brainard Automatic Gear Cutter complete.

We carry a complete line of Independent and Universal Chucks.

THE MORTON MACHINERY COMPANY
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PARTIAL LIST

LATHES

14 x 5 Seneca Falls.
14 x 6 Sebastian.
15 x 6 Monarch.
15 x 6 Springfield, Q.C.G.
20 x 8 Prentiss, geared head, S.P.D.
21 x 36 x 16 LeBlond gap.
18 x 8 Superior, Q.C.G. (New).

MILLERS

U. S. Hand miller (New).
No. 1½ American plain (New).
No. 1½ Becker Universal.
No. 2 Becker Universal.
No. 2 Brown & Sharpe plain.
No. 2 Becker plain.
No. 3 Becker plain.
Brown & Sharpe manufacturing miller.
Lees-Bradner thread miller.
No. 25 Becker plain.
No. 13 Garvin plain.
No. 3½ Fox plain.
10 x 28 Bristol vertical.

GRINDERS

No. 2 Brown & Sharpe surface.
No. 3 Brown & Sharpe universal.
Yankee twist drill grinder.
Gardiner No. 1 disc.
Besley No. 14 disc.
12 x 36 Bridgeport plain.
10 x 52 Landis cylindrical.

SHAPERS

24-in. Fay & Egan pony-wood planer.
24-in. Gould & Eberhardt.
28-in. Smith & Mills, planer type.
32-in Smith & Mills, b.g. speed.

PRESSES

Single-spindle Henry & Wright drill.
2-spindle Henry & Wright drill.
20-in. Excelsior, b.g. new drill press.
20-in. Reed geared ball bearing drills.
26-in. Barnes G. H. sliding head drill.
36-in. Fitchburg b.g. sliding head drill.
36-in. Snyder b.g. sliding head drill.
Henry Rueson power press, 1½ ft. str.
Zeh & Hahnemann reducing presses.
14-in. stroke (horizontal).

PLANERS

30 x 30 x 10 Powell, 2-heads on rail equipped for motor drive (new) planer.
36 x 36 x 14 Woodward & Powell single head.
36 x 36 x 12 Niles, 2-heads.

BORING MILLS

1—60-in. Niles, 2-head, s.p.d. vertical boring mill.
No. 26 Epson Lucas horizontal boring mill, 4-in. bar.
90-in. Old type vert. boring mill

MISCELLANEOUS

11—New No. 2 Garvin screw mach., wire feed, auto. collets.
1—5-ton United Foundry crane.
2000 lb. Chambersburg steam hammer.
8-in. Schuchart & Schutte gr. hobber.
No. 2 Norton keyseater.
Williams Shredder.
Farrel crusher.
2-in. Saunders pipe machine.
2-spindle Pratt & Whitney profiler.
Garvin single-spindle profiler.
Blaisdell vacuum pump, d.c. motor.
1—Newbold circular shear 28-in. throat.
No. 5-B United Engineering shear.
Racine hack saws.
Morton traveling head slotter.
No. 5 Langelier swaging machines.
Garvin automatic tapping machine.
1½-in. 4-headed Webster & Perks bolt threader.

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MACHINES *AVAILABLE FOR IMMEDIATE DELIVERY*

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4—Roulsted 21 x 8 Lathe (Heavy Duty).
2—American 18 x 8 Lathe (Q.C.G.).
1—Myers 11 x 5 Lathe (New).
1—Seneca Falls 10 x 4 Lathe (Indrawn Att.).
2—Hendy 14 x 6 Lathe (Indrawn Att., Q.C.G.).
2—American 16 x 6 Fox Monitor Lathes.
1—Reed 20 x 5 Speed Lathe (Compound Rest).
1—LeBlount 14 x 5 Speed Lathe (Compound Turret Att.).
10—Speed Lathe, 12 x 4.

DRILLS

14—Allen 6 Sp. H.S. Drills.
3—Kern 3 Sp. H.S. Drills.
3—Harding Precision Bench Drills.
1—6-Spindle Drill.
3—Taylor & Fenn 3 Sp. Drills.
2—Taylor & Fenn 2 Sp. Drills.
4—Quint Drills (Turret Head).
1—Snyder 28-in. B.G. Drill.
1—Barnes 26-in. B.G. Drill.
2—Snyder 24-in. B.G. Drill.
1—Barnes 22-in. B.G. Drill.
1—Silver 20-in. B.G. Drill.

GRINDERS

1—Landis No. 1 Grinder.
2—Wells Tool and Cutter Grinders.
1—Norton Universal Grinder.
1—Garvin Production Grinder (Heald Magnetic Chuck).

SHAPERS

1—Gould & Eberhardt 18-in. Shaper.
1—Pratt & Whitney 17-in. Shaper.
2—Smith & Mills 16-in. Shaper.

MILLERS

1—No. 1 Brown & Sharpe Universal Miller.
1—No. 1 Garvin Universal Miller.
1—4-B Becker Vertical Miller.
1—Steptoe Hand Miller.
1—Garvin Hand and Power Miller, No. 0.
4—Burke Bench Millers, No. 1.
12—Burke Bench Millers, No. 3.

SCREW MACHINES

3—National Acme Automatic Screw Machines, No. 54 (4 Sp.).
1—National Acme Automatic Screw Machine, No. 515 (4 Sp.).
4—Warner & Swasey No. 2 Screw Machines (Wire Feed).
2—Pratt & Whitney No. 2 Screw Machines (Wire Feed).
3—Garvin No. 2 Screw Machines (Wire Feed).

MISCELLANEOUS

1—Yankee Twist Drill Grinder.
1—Bliss No. 20 Power Press.
2—Bliss No. 18 Power Presses.
1—Federal Planer, 10-in. x 10-in. x 24-in.
1—250-lb. Trip Hammer.

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J. Morton Poole heavy pattern, floor type, horizontal Boring Drilling and Milling Machine, 5¼-in. bar.
E. & A. Betts Knee Type Horizontal Boring Machine, 3-in. bar, star facing head, yoke support.
Beaman & Smith Cylinder Boring and Facing Machine, 4-in.bar.

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72-in. **Niles**, 2 swivel heads.
50-in. **Bridgeport**, 2 swivel heads.
42-in. **Bullard**, 2 heads, heavy table.
38-in. **Brown & Sharpe** No. 2 Vertical Turret Chucking Machine.
30-in. **Niles** Vertical Turret Chucking Machine.

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8-in. throat **Morgan Engineering Works** Vertical Bull Riveting Outfit, capacity to rivet shell to 16 ft. long, complete with crane, hydraulic pump, accumulator, fittings. **Special price before removal.**

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4500-lb. **Bement & Son** Double Frame Steam Forging Hammer.
500-lb. **Merrill Bros.** Board Lift Drop Hammer.
200-lb. **Beaudry No. 7** Peerless Power Hammer.
150-lb. **Beaudry No. 6** Peerless Power Hammer.

LATHES—ENGINE

78-in. x 20-ft. **New Haven** Pattern triple geared compound rest, 4-in. hollow spindle, rising block to 102 in.
42-in. x 19-ft. **Fitchburg** Heavy Facing Plate, drive C.R., P.C.F.
32-in. x 35-ft. **Bement-Niles** double end Lathe 29 ft. between centers, face plate drive C.R., P.C.F.
32-in. x 14-ft. **Bement-Niles** face plate drive C.R., P.C.F.
24-in. x 18-ft. **LeBlond** C. R., 2¼-in. H. S., quick change gear.
24-in. x 14-ft. **Lodge & Shipley** C. R., quick change gear.
18-in. x 10-ft. **Schumacher, Boye & Emmes**, D.B.G., C.R., quick change gear.
18-in. x 8-ft. **Lodge & Shipley** C. R., quick change gear, taper att.
18-in. x 6-ft. **Hamilton**, D.B.G., C.R.
16-in. x 8-ft. **Pratt & Whitney**, C.R., P.C.F.
16-in. x 6-ft. **LeBlond**, C.R., P.C.F.
14-in. x 6-ft. **Lodge & Shipley**, C. R., P.C.F., quick change gear, taper att.

MILLING MACHINES

3—No. 5 **Brown & Sharpe** Plain Milling Machines 54 x 14.
3—No. 4 **Brown & Sharpe** Plain Milling Machines 48 x 12¼.
No. 1 **Rockford** Plain, 30 x 7½.
No. 3 **Newton** Duplex, 84 x 13.
Becker-Brainard Duplex, 40 x 14.
48 x 36 x 14-ft. **Ingersoll**, 4-spindle slab.
30 x 30 x 14-ft. **Newton**, slab.
24 x 24 x 6-ft. **Ingersoll**, slab.

PLANERS

60 x 60 x 14-ft., Sellers, 4 heads.
54 x 54 x 12-ft. **Pond**, 4 heads.
54 x 54 x 12-ft. **Niles**, 4 heads.
32 x 32 x 8-ft **Pond**, 2 heads.
22 x 22 x 5-ft. **Whitcomb**, one head.
No. 3H **Niles & Jones** 20-ft. Plate Edge Planer 1-in. plate.

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50-ton **Falkenau Sinclair** Geared Double Action Press, stroke of plunger 5 ft., ram 2½.
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26-in. throat **Quintard** Punch, through 1 in.
30-in. throat **Quintard** Shear, ½-in. plate.

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1—Haskens Type FB-206 **Electric Furnace.**
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2—250 lb. **Little Giant Hammers.**
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1—No. 34 Ohio Heavy **Plain Miller.**
2—No. 7 Becker Lincoln **Millers.**
1—36 x 36 x 8 New Haven **Planer.**
1—No. 54 Beloit Comb. **Punch and Shear.**
1—No. P-3 **Ferracute Press.**
1—Panghorn Type AC-6 **Sand Blast.**
1—16-in. **Barker Shaper.**

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1—22 x 22 x 5 ft. S. H. Cincinnati Planer.
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1—18 x 8 Rahn-Larmon Lathe.
1—22 x 10 Davis Lathe.
1—30 x 10 American Lathe.
1—24 x 12 American Lathe.

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Three 3¼-in. capacity, single spindle

Gridley Automatic Screw Machines

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1—No. 4 Rock River Bulldozer, arranged motor drive, 20-in. stroke, size cross head 57-in. x 12-in., dis space at end of stroke 38-in.

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1—No. 2-A Landis 16 x 32 Universal Grinder.
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1—No. 2 Brand New Oakley Universal Cutter and Tool Grinder.

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3—16-in. Whipp S. G. Crank Shapers (New).
2—20-in. Ohio B G. Crank Shapers (New).
1—Each 16, 18, 21, 24-in. Hollingsworth Back Geared Crank Shapers (New).

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2—No. 2½ American Plain Mills (New).
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1—17-in. x 8-ft. Perking Engine Lathe, Hollow Spindle, complete with plain rest, countershaft, face plate, wrenches, etc., in first-class operative condition.
1—Each Sidney Medium Pattern Lathes, 14, 16, 18, 20-in. by 6, 8, 10-ft. beds, 3-step cone, D.B.Q.C.G.
1—Each Sidney Heavy Duty Lathes, 15, 17, 19, 25, 27-in. by 6, 8, 10, 12, 14-ft. beds, 3-step cone, D.B.Q.C.G.
1—14-in. Flather Lathe, P.R.H.S.

MISCELLANEOUS

1—No. 6 Quick Work Rotary Shear, 48-in. throat. 1-in. cutting capacity.
24 x 24-in. x 6-ft. Gray Planer, one head on cross rail.
1—26-in. x 24-in. x 8-ft. Pond Planer, 2 heads.
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2—No. 7 Long & Alstatter Punch & Shears, approximate 5-in. throat, capacity ⅝ x ⅝-in.
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1—6-A Toledo Butt Welder, capacity 1¼ rd.
1—Williams Pipe Machine, capacity ¼ to 2-in.
No. 3 Brown & Sharpe 26-in. Gear Cutter.
1—No. 38 Forbes Threading and Cut-Off Machine.
1—21-in. Westcott 4-Jaw Spur Gear Scroll Combination Chuck.

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21-in.-25-in. x 8-ft. and 10-ft. LeBlond.
Heavy Duty Universal Lathes.
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Pneumatic Air Hoists, Air Balanced Type. 4-in. and 6-in. with 4-ft. Lift.

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1—6 x 32 Norton plain grinder.
1—34-in. Cleveland Automatic.
1—4¼ Cleveland Automatic.
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SECOND-HAND

MACHINERY

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2—4-ft. bed Hurlbut-Rogers.

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4—Demco Bench Drills, new.
18-in. Baker, stationary head, hand lever and power feed.
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16-in. Hoefer, actual swing 44-in. ingle spindle, assembling.

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1—48-in. x 10-in. Gould & Eberhardt new type, for spur gears only.

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16-in. x 16-ft. cone driven, Bridgeport automatic threading.
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3—1-in. Truman M. Smith, with countershafts.

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2—1½-in. 2-spindle Landis BOLT CUTTERS.
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1—14-in. Rockford DRILL.
1—No. 1 Landis Universal GRINDER.
1—Mummert-Dickon Scraper GRINDER.
1—No. 2 Brown & Sharpe Cutter GRINDER.
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Flat Top Turrets, Roll Feed and Auto Chuck. Almost new.

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complete with equipment.

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1—16-in. Dreses, friction back gear, automatic chuck.
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1—No. 2-A Warner & Swasey, Chucking equipment.
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3—36-in. Fellows Gear Shapers, regular equipment.
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1—30-ton Lucas Vertical.

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2—14 x 6-in. Reed Standard Type.
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18-22-26-30-32-36-42-48-54-in. between housings, 1, 2, 3 and 4 heads.

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30, 36, 37 and 51-in.

HORIZONTAL BORING MACHINES

2½, 3, 4-in.; also 5-in. Barret Type

RADIAL DRILLS

2½, 3 and 4-ft. Plain and Universal.

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12, 24, 36 and 42-in.; also 3 and 6 spindle

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Various sizes from 14 to 92-in. swing

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3 x 24 in., 20 x 6 ft., 20 in. 28 in. 24 in.

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58 x 38 x 14-ft. Ingersoll, 4 heads; 20-in. x 7 Brainard; No. 2 Lodge & Davis; No. 2 Hilles & Jones vertical.

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338 tons—2⅝ in. round, 12-12½-ft. lengths.

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6—No. 56 National Acme Automatics.
5—No. 55 National Acme Automatics. (Oversize colts).
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2—1¼-1½ in. Model A Cleveland Automatics. (New).
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2—24 in. x 10 ft. Lodge & Shipley D.B., Q.C. Lathe.
2—22 in. x 10 ft. Lodge & Shipley D.B., Q.C. Lathe (all geared head).
1—30 in. x 14 ft. Niles D.B., Q.C. Lathe.
1—26 in. x 14 ft. Niles D.B., Q.C. Lathe.
10—No. 2 Warner & Swasey H.S. Machines.
12—No. 4 Warner & Swasey H.S. Machines.
2—24 in. Gisholt Turret Lathes, practically new.
1—Potter & Johnson, equipped for pistons.

Also new and used Hacksaws, Drill Presses, Tappers, etc. Send us list of machines you want or have for sale.

Broadway Machinery Company

Cincinnati, Ohio

No. 1 Cleveland Hor. Boring Mill 2½-in. Bar.
12 x 42 Landis Cylindrical Grinder.
No. 200 Heald Ring Grinder.
No. 2 Brown & Sharpe Plain Milling Machine.
No. 1½ Valley City Universal Miller.
No. 13 Brown & Sharpe Spur and Bevel Gear Cutter.
36-in. Gould & Eberhardt Spur Gear Cutter.

1000 Other Machine Bargains

Surplus Machinery

GEAR CUTTERS

2—6 in. Gleason Generators.
3—15 in. Gleason Generators.
2—3 x 36 Brown & Sharpe.
1—No. 13 Brown & Sharpe.
2—24 x 10 G. & E. Blockers.
2—36 in. Fellows Gear Shapers.
2—40 x 10 x 4 Fellows.

GRINDERS

5—No. 1 Landis Internal.
4—No. 6 and No. 6A Bryant.
1—No. 2 W. & M. Surface.
1—60 Heald, Motor Drive.

LATHES

1—16 x 6½ Davis, Plain, C.R.S.B.G.
1—18 x 8 Davis, Plain, C.R.S.B.G.
3—3½ x 60 LoSwing.
2—18 x 12 ft. 8 in. Bridgeford Packard, S.P.Dv.
3—Bridgeford Bevel Gear Blankers.

MISCELLANEOUS

1—48 x 48 x 32 ft. Cincinnati Planer, 4 Hds.
1—4 ft. Mueller Radial Drill, Gear Bx.Dv.
7—No. 56 Acme Automatics.
6—Cleveland Automatics, ⅝ in. to 2¾ in.
5—Chicago Automatics, 1¼ to 2 in.
1—40 lb. Bradley Helve Hammer.
1—3½ in. Moline Cylinder Borer.
1—Style A-38 in. Briggs Miller.
1—No. 6 Lees-Bradner Thread Miller.
1—32 in. x 20 ft. Ingersoll Miller, 3 Hds.

H. L. ROSCOE
544 S. Goodman St., Rochester, N. Y.

USED BETTS BORING MILLS

FOR SALE

1—76-in. Betts Boring Mill with two heads on rail.

Thickness of table	7½ in.
Diam. of table	72 in.
Largest Diam. machine will swing	76 in.
Greatest distance under rail	58 in.
Width of face of housing	9 in.
Width of belt	4 in.
Number of steps on Cone	5

16 1⅛-in. Tee slots in table.
Ready for release January 31, 1920.

1—100-in. Betts Boring Mill with three heads on rail.

Thickness of table	10 in.
Diam. of table	84 in.
Largest Diam. machine will swing	100 in.
Greatest distance under rail	22½ in.
Width of face of housing	9 in.
Width of belt	4 in.
Number of steps on Cone	5
Width of rail	22 in.
16 Tee slots on table	1¼

Released Jan. 10, 1920. May be seen in operation at our plant, or write for prices to

The Bessemer Gas Engine Co.
Grove City, Pa.

FOR SALE

3 Used Steinle 24-in. **full swing side carriage**

TURRET LATHES

CADILLAC TOOL CO.
268 E. Jefferson Ave., Detroit, Mich.

For Immediate Delivery

1—16-in. Smith & Mills SHAPER.
1—16-in. Potter & Johnson SHAPER.
1—3 sp. BAUSCH DRILL.
1—Norton Tool Room GRINDER.
1—Norton GRINDER 6 x 32.
2—No. 4 Cincinnati MILLERS.
5—No. 3 Cincinnati MILLERS sgle. pul. dr.
3—No. 2 Cincinnati UNIVERSAL MILLERS sgl. pul. dr.
2—Cin. PLANERS, 36 x 36 x 12; 4 hd. mtr. dr.
Hendey LATHES 18 x 8 x 18 x 10 sgle. pul. dr., pat. hd. and 6 cone pul. dr. pan.
1—PELTON SLOTTER with rotary table.
1—No. 4 Barton & Oliver power feed also wire feed.
No. 3 Kempsmith MILLER, Universal.
No. 2 Kempsmith MILLER, Universal.

NOBLE MACHINERY CO.
128 Bleecker St., New York City

FOR SALE

Niles-Bement-Pond 60-in. Duplex Control
Horizontal Boring Drilling and Milling Machine

with 4½-in. bar. Equipped with 10 hp., d. c., 220-volt, variable speed 4-1 Westinghouse motor.
Equipped with facing head.
Length of bed 9 ft., being 2 ft. longer than Standard.
Latest pattern. Used only four months. Condition 99%.

Details upon request.

MANUFACTURER
Quincy, Illinois

FOR SALE

4½-ton, 4½ x No. 20 gauge cold rolled strip steel in coils.
2½-ton, 1½ x No. 18 gauge cold rolled strip steel in strips.
15-ton, ⅝ x No. 14 gauge cold rolled strip steel square edge in strips.
6-ton, ⅝ Rd. cold drawn steel in bars.
300-lb., 3/16 Rd. cold drawn steel in bars.
700-lb. ⅛ x 1⅛ hot rolled steel in scrolls.

Sherwood Bros. Mfg. Co., Inc.
Canastota, New York.

PLANERS FOR SALE

2—Pedrick & Ayer Traveling Head Planers, one with 10-ft. bed, 24-in. reach and 7-ft. stroke, and one with 11-ft. bed, 30-in. reach and 7-ft. stroke. Both in excellent condition and can be released promptly.

THE WHIP MACHINE TOOL CO.
Sidney, Ohio

Used Machines in Stock

MILLERS

3—No. 2 Cincinnati Plain Millers.
1—No. 2 Van Norman Duplex Miller.
1—Type "A" Briggs Miller.
1—No. 00 Brown & Sharpe Plain Miller.
4—Knight Duplex Millers.
1—P & W Semi-Automatic Lincoln Millers.
1—Hendey Lincoln Type Miller.

SCREW MACHINES

1—No. 1—¾-in. Chicago Screw Machine.
1—No. 2—1¼-in. Chicago Screw Machine.
1—No. 3—1⅝-in. Chicago Screw Machine.

LATHES

1—Hendey 14 x 6 Tool Room Lathe.
1—Lodge & Shipley 14 x 6 Q. C. Lathe.
1—Fay & Scott 26 x 12 Engine Lathe.
2—Bridgeport Automatic Lathes.
1—24-in. Gisholt Turret Lathe.

GRINDERS

1—Brown & Sharpe No. 1 Universal Grinder.
1—Brown & Sharpe No. 2 Universal Grinder.
1—Landis No. 2 Universal Grinder.
2—Landis 10 x 30 Plain Grinders.
6—Fitchburg 6 x 15 Plain Grinders.
2—6 x 48 Pratt & Whitney Grinders.
2—No. 14 Brown & Sharpe Grinders.

MISCELLANEOUS

1—3⅝-in x 7-in. Plain Slide Machine.
6—Chicago Semi-Automatic Threaders.
10—No. 6-A Potter & Johnson Chucking Machines.

Industrial Machinery Co.
No. 147 Provost St., Jersey City, N. J.

FOR SALE

2—60 hp., 225 revolutions per minute, Type D. H.

OIL ENGINES

complete with accessories, three years old; first class condition, now operating.

MOHEGAN TUBE COMPANY
Scott Ave. & Meserole St., Brooklyn, N. Y.

FOR SALE

20,000 lb. of
COLD ROLLED STEEL
in strips 8 ft. long and 6 5/16 in. wide, 0, 50 or 18 gauge.

P. B. CANDY CO.,
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FOR SALE

New Electric Arc Welding Outfits

10—150 amperes and 1—600 amperes sets, direct connected to D. C. 230 v. motors. All sets brand new and complete with panels, mounted on trucks. 600 ampere outfit has 3 panels.

I. STARK & CO.
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FOR SALE

1000—3½-in. **Machinist Vises**, A-1 condition.
2—22-in. x 18-ft. **Putnam Lathes**, A-1 condition.
20 tons ¾-in. **Sisal Rope.**
10,000 gross 1½-in. **No. 10 Flat Head Bright Wood Screws.**
4,000 gross 1¾-in. **No. 16 Flat Head Bright Wood Screws.**
2,000 gross 2-in. **No. 16 Flat Head Bright Wood Screws.**

ABE COOPER
401-419 Tracy St., Syracuse, N. Y.

FOR SALE

Used, yet in good condition

"ROCKWELL"

Forging, Annealing and Hardening

OIL FURNACES

Different sizes, Chamber dimensions from 18 in. x 14 in. x 14 in. to 60 in. x 72 in. x 26 in.

Can be inspected at Bridgeport, Conn.

For quotations and particulars write to

RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES

711 Flatiron Building New York City
Department F.

A FEW CHOICE OFFERINGS

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No. 14-A Garvin plain, like new.
Oesterlein Universal, 7½ x 18 x 24.
6—Brown & Sharpe No. 1 Plain.
6—Brown & Sharpe No. 2 Plain.
3—No. 3 Burke bench hand.
No. 5 Brainard, 60 in. table mtr. dr.

LATHES and GEAR CUTTERS

6—Sebastian type gap, 15 x 23-in. x 6-ft.
6—Monarch 14 x 6 single and double bk. gr. Q.C.G.
3—Willard, 13 x 6, pan bed, D.B.G.
Newark gear cutter, No. 2-A, 24 x 8.
Brainard 24-in. automatic, spur and bevel.
6—South Bend 16 x 6 lathes.
2—15-in. Fox lathes.
2—Monarch lathes, 16 x 8, like new.
3—Monarch, 18 x 6, Q.C.G. geared head.

DRILLS and GRINDERS

2—Hamilton, 28-in. sl. head.
6—New Excelsior, 14-in. sensitive.
6—Buffalo 20-in. B.G. drills, new.
1—3-spindle Allen high speed drill with oil pump.
6—3 and 4 spindle Reid drills.
Henry & Wright 6-spindle drill.
Allen single spindle H. S. ¾ drill.
Morse cylindrical 7 x 30 grinder.
Cincinnati No. 1 Universal cutter grinder.
No. 1 Morse Universal Grinder.

MISCELLANEOUS

300-lb. Drop Hammer, automatic lift.
1—Brown & Sharpe No. 2 semi-automatic screw machine, full set of collets.
2—Nat'l Acme automatic screw slotters.
1—Power belt hammer.

SHAPERS

16 in. Rockford Shaper.
30 in. Cincl. triple g.
2—24 in. Gould & Eberhardt b.g.
24 in. Queen City b.g.
1—Hendey 15 in. tool rm.

PRESSES

6—Bliss No. 16 horning.
2—No. 068 Bliss double action.
25 No. 20 Bliss, fine condition.
6—1½ Bliss Toggles—Friction Clutch, like new.
2—No 2 Baird Double Action.

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***Write or Wire* J. GELB & COMPANY, 201 Centre St., New York City**

Brand New Chucks

Large Reduction from Manufacturers Prices

3—22-in. Horton No. 50 Independent 4-jaw Chucks.
6—21-in. Horton Universal 3-jaw Chucks.
39—6-in. Reversible and Combination Almond 3-jaw Chucks.
31—7½-in. Reversible and Combination Almond 3-jaw Chucks.
5—9-in. Reversible and Combination Almond 3-jaw Chucks.

MOREY and COMPANY, Inc.
Formerly Machinery Merchants, Inc.
50 Church St., New York City

TANK

STEEL DISCS

(various diameters)

for

IMMEDIATE DELIVERY

F. S. 214—American Machinist
10th Ave. at 36th St., New York City

FOR SALE

GENERATORS

1—Westinghouse 500 kw. Turbine Generator, 480 volts, 600 amps., 3 phase, 60 cycle, 900 r.p.m., speed of turbine 6000 r.p.m.; complete with switchboard.....$5000

1—Westinghouse Generator and Motor, 10 kw., 125 volt, 80 amps., 1130 r.p.m., 16 h.p., 3 phase, 60 cycle, 440 volt; complete with switchboard $425

1—Westinghouse Motor and Generator, 37½ kw., 125 volt, 300 amps., 850 r.p.m., 60 h.p., 3 phase, 60 cycle, 440 volt; complete with switchboard $1000

SIMMONS MACHINE CO., Inc.
c/o Colt's Patent Fire Arms Co.
Meriden, Conn.

For Immediate Delivery

1—¾ in. **Gridley 4-spindle Automatic**
No. 2 Bardons & Oliver Hand **Screw Machines**
1—2-3-4-5- and 6-spindle B. B. **Drill Presses**
Briggs Millers, some long table and quick return
No. 5B and 5C Manville **Dial Presses**
Number of Precision **Bench Lathes**
Above latest type and like new
Two 15 in. **Hendey Shapers,** good condition
Whitney Millers, Power and Hand Feed A1.
Jones & Lamson Flat Turret G. H. Lathes
Lot of other items new and used

IDEAL MACHINERY CO.
East Main St., Plainville, Conn.

ANGLES

4000 Tons—Carbon .35

Approximate tonnages	*Sizes*	*Lengths*
40	⅝-in. x ⅝-in. x ⅛-in.	3-ft.–3 ⅛-in.
440	¾-in. x ¾-in. x $\frac{3}{16}$-in.	3-ft.–3 ⅛-in.
130	1 -in. x 1 -in. x ¼-in.	6-ft.–6 ⅝-in.
1800	1½-in. x 1½-in. x $\frac{5}{16}$-in.	5-ft.–3-in.
700	1½-in. x 1½-in. x ⅜-in.	21-ft.–0-in.
950	2 -in. x 2 -in. x ¼-in.	9-ft.–10-in.

Exceptional Prices.* *Immediate Shipment.* *Write.* *'Phone.* *Wire

L. A. FLORENCE, 29 Broadway, New York City

Two No. 76 National-Acme Automatic Screw Machines

Capacity up to 2½ ins. Equipped with 2⅝ ins. over-size collet and feed fingers. Machines in excellent condition, having been used about one year.

Grand Rapids Show Case Co.
Grand Rapids, Mich.

POWER PRESSES

1—No. 3 Zeh & Hahneman Power Presses, practically new.
1—Stiles Large Blanking Press, 37-in. between the housings.
1—No. 2 Bliss Power Press, 3-in. stroke, built in 1918.
3—No. 20 Bliss Power Presses, 3-in. stroke, built in 1918.
1—No. 23 Consolidated Horning Press, practically new.
1—No. 01 V. & O. Power Press, practically new.

SHAPERS

1—16-in. Kelly Back-Geared Shaper, 95% new.

SCREW MACHINES

2—No. 2A Warner & Swasey Geared Head, Universal hollow hexagon.

DRILL PRESS

26-in. Prentiss Back-Geared Drill Press.

MILLER

1—No. 1½ Le Blond Universal Milling Machine, dividing heads, complete.

GRINDER

1—No. 60 Heald Internal Grinder, complete

All the above mentioned tools are guaranteed to be in good working condition.

J. E. Duff Co., Inc. **247-249 Centre Street, New York**

Immediate Delivery

5—24-in. Gisholt Turret Lathes, excellent condition.

2—No. 3 Brown & Sharpe Universal Grinders. Excellent condition.

2—No. 2 Brown & Sharpe Universal Grinders, excellent condition.

1—36-in. x 48-in. x 16-ft. Detrick & Harvey Open Side Planer, excellent condition.

1—48-in. x 14-ft. Enterprise Lathe, good condition.

1—24-in. x 12-ft. Schumaker & Boye Engine Lathe.

1—6-ft. Baush Plain Radial. Arranged for motor drive. Fair condition.

1—11-ft. Pond Vertical Boring Mill, with motor drive, first-class condition.

We Are in the Market for:

No. 0 Brown & Sharpe Grinders.
No. 4 Warner & Swasey Screw Machines.
24-in. Gould & Eberhardt Shaper.

Saxer Machinery Co., Erie, Pa.

FOR SALE

ROCK BOTTOM PRICES

IMMEDIATE SHIPMENT

1—No. 2A Warner & Swasey hollow hex. Turret Lathe.
1—No. 13 Brown & Sharpe spur and bevel Gear Cutter.
1—24-in. x 24-in. x 6-ft. Powell Planer.
1—24-in. Davis chucking Turret Lathe.
1—Reed-Prentice Semi-Automatic Lathe.
1—8½-in. x 16-in. Potter & Johnson Turret Chucking Lathe.
1—6-ft. Automatic Screw Machine Co.'s Turret Chasing Lathe.
1—No. 2½ Garvin hand Screw Machine, with wire feed.
3—2¼-in. Gridley Single Spindle Automatic, motor driven.
1—24-in. Kelley back geared Shaper.
1—No. 4 Bardons & Oliver Screw Machine, power feed to Turret Slide.
1—No. 4 Warner & Swasey power feed to Turret Slide.
1—16-in. x 6-ft. American Engine Lathe.
4—No. 7 Atkins Kwik-Kut power Hack Saws.
1—16-in. x 6-ft. LeBlonde Engine Lathe.
1—8-in. x 6-ft. Gardner Duplex Air Compressor.
1—6-in. x 6-in. Snyder-Hughes Air Compressor.
1—No. 20 Landis Grinder and Countershaft

Let us send you full description and our special prices. Write us your wants.

C. E. FALES MACHINERY CO.
Kerr Building, Detroit, Mich.

SECOND-HAND

MACHINE TOOLS

1—24-in. x 12-ft. Double Back Gear Lathe with Turret, O. P. P. & P.
The above is a Greaves-Klusman Lathe.
1—36 x 36 x 20 D. H. Gray Planer
1—Grind Stone, 36-in. x 6-n. Stone
1—Crane Scale, 25,000 lb. capacity.
1—6-Ton Reading Hoist.
1—Birdsboro Belt Lacing Machine.
1—Sensitive Drill.

THE GREAVES-KLUSMAN TOOL CO.
Cincinnati, Ohio

TAPER PIN REAMERS

Immediate Shipment From Stock

Prices on Application

HYDE PARK MANUFACTURING COMPANY, Hyde Park, Mass.

Immediate Delivery

Used Machinery

2½-in. Industrial Works Horizontal Boring Mill.

60-in. Bullard Boring Mill, 2 swivel heads.

42-in. Gisholt, 1 turret, 1 swivel.

76-in. Bullard Boring Mill, 2 swivel heads.

6-ft. Gang Radial Drill.

32-in. x 18-ft. Bradford Lathe.

18-in. Canadian Machinery Corp. Slotter.

No. 7 Massillon single end punch and shear.

36-in. throat, arch jaws, capacity 1¼ in. thru 1 in. (new).

No. 4 Warner & Swasey Universal Screw Machine with a.c. and w.f.

No. 4—48-in. Brown & Sharpe Gear Cutter.

STOCKER-RUMELY-WACHS CO.
117-121 N. Jefferson Street, Chicago, Ill.

1—135 HP. Reeves vertical

GAS ENGINE

complete with gas regulator, gas reservoir, compressor, etc., also

1—100 HP. Land

GAS PRODUCER

This equipment is practically new, only used about six months. Full details upon request.

The Acme Machine Tool Company
Cincinnati, Ohio, U. S. A.

FOR SALE

2—1000-lb. E. W. Bliss Drop Forging Hammers.
5—21-in. LeBlond Lathes, equipped with 15-in. three-jaw Universal Chucks and taper attachments.
2—14-in. U. S. Sensitive Drills.
2—No. 1 Garvin Tapping Machines.
1—No. 2 Garvin Tapping Machine.
1—20-in. Sipp Sensitive Drill.
1—14-in. Girard Lathe.
1—J. A. Stowell Grinder, Saxon No. 2.
1—D-75 Ferracute Press, with outside cut-off.

RICHMOND FORGING CORPORATION
(Acca) Richmond, Va.

Tools for Immediate Shipmen

14-in. x 6-ft. Hamilton Lathe, h.s., comp. rest.
18-in. x 8-ft. Hamilton Lathe, dbl. bk.gr. New.
1¼-in. S. & K. Hand Screw Machine.
1¼-in. Wood Hand Screw Machine.
1¼-in. S. & K. Hand Screw Machines (2).
16, 18 and 24 Barker Shaper, crank. New.
24, 24-in. x 6-ft. Sellers Shaper.
3½-in. Canedy-Otto Radial, plain. New.
4½-ft. Plain Radial. Baush.
Grand Rapids Grinder, Cutter and Reamer.
Miller No. 2 B & S, heavy, plain.
16-in. x 6-ft. Springfield Lathe, h.s., C.P.R. taper.
25-in. x 24-ft. Fifield Lathe.
20-in. x 16-ft. LeBlond Lathe, h.s., C.P.R.
2 x 24 and 3 x 36 J & L., double equipment.
22 x 22-in. x 6-ft. Gray Planer.
24 x 24-in. x 8-ft. American Planer.
26 x 26-in. x 8-ft. Niles Planer.
32 x 32-in. x 10-ft. Niles Planer.
Boring Mill, 10 ft., 2 swivel heads.
Boring Mill, 34-in. Colburn, 4-hole Turret Head.

THE OSBORNE & SEXTON MCHY. CO.
Columbus, Ohio

PLANERS

Hillis & Jones Plate Planer, No. 4 will cut 40 feet at one setting.

Pond Machine Co., 60-in. x 60-in. x 16-ft. Planer, 3 heads.

Cleveland Open side Planer, 42-in. x 12-ft. 2 heads.

Dietrick & Harvey Openside Planer, 36-in. x 8-ft. 2 heads.

John Moore Co., Planer, 38-in. x 38-in. x 10-ft. 1 head.

W. H. BOSWORTH
Commercial Bank Bldg., Cleveland, Ohio

CHEAP—Must Move

No. 5 Newton Milling Machine, B. G. vertical attachment.
Williams & White Welding Press.
Spoke Riveting Machine.
Justice Power Hammer.
A. D. T. ⅜ Wire Straightener.
48-in. Car Wheel Borer.
4-ft. Bending Roll.
6-ft. Keene Brake.
15—No. 2½ Hendey Lincoln type Milling Machine.
24 x 24 x 6 Hendey Planer.
22 x 8 D. B. G. Engine Lathe.
20 x 14 S. B. G. Engine Lathe.
20 H.P. Vertical Boiler.
Several Air Compressors.
150-Ton Hydraulic Press.

A. M. STOEHR
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Good as new **Immediate Delivery**

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NEW AND USED

Machine Tools and Power Transmission

93-105 Chestnut St., Newark, N. J.

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Sebastian Engine Lathe, 14 in. 5 ft. between centers, 8 in. and 14 in. face plates, 4 speed countershaft, $300.

Blount Speed Lathe, 11 in. x 6 ft., $75.

Fairbanks Power Hack Saw, $35.

HERMANCE MACHINE CO.
Williamsport, Pa.

FOR SALE

Full Line of Machine Tools

Drawings, Patterns, jigs and templates, entirely up to date. On the market for 24 years. Good agents.

Apply Box 61, Station B, Cincinnati.

TOTE BOXES OF SHEET STEEL FOR SALE

SIZES

17⅞ in. x 9½ in. x 2 in.
18 in. x 10 in. x 2⅞ in.

Also Tote Boxes, racks and trays of White Pine. Attractive prices, especially to buyers of big lots.

RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES
711 Flatiron Bldg., New York City

TRIMMING PRESSES

Two Toledo No. 59¼ Double Geared, Straight Column Trimming Presses, with Friction Clutch. 6-in. Stroke. 95% New.

Russell Machine Co., Inc.
Pittsburgh, Pa.

WANTED
IMMEDIATELY
One
PHOTO-STAT MACHINE

Must be in perfect working order. Send photo and full description of make and price.

T. McAVITY & SONS, Ltd.
Box 700, St. John, N. B.

WANTED
Three, either of No. 1 or No. 1-H Vertical Spindle
Milling Attachments
for No. 1 Plain B. & S. Milling Machines.

THE LINOGRAPH COMPANY
Davenport, Iowa

WANTED—TANKS

4-4,000 to 10,000 gal. 1-25,000 to 50,000 gal.
1-55,000 Barrel or might use 2-30,000 Barrel

Describe fully and name lowest cash price in first letter

W239—American Machinist, 1570 Old Colony Bldg., Chicago, Ill.

Machine Tools Wanted

We shall at all times be glad to receive offers of second-hand machines in good condition, as we from time to time have demand for these from overseas.

ALFRED HERBERT, Ltd.
54 Dey Street, New York City
Head Office and Works: Coventry, England

WANTED
ONE ELECTRIC TRAVELING CRANE
Second-hand, 40-foot span, 10-ton capacity.
Sweet & Doyle Foundry & Machine Co.
Green Island, New York

WANTED
One each Nos. 14 and 30 Natco
HEAVY DUTY MULTIPLE SPINDLE DRILLS
Good condition or new.
Also all types Brown & Sharpe **Automatics.**
Carter Machinery Sales Co.
Buffalo, New York

WANTED
Used Cleveland Automatic
SCREW MACHINES
⅝-in.–¾-in. Model B.
2-in. Model B.
Serial number above 16,000.
W316—American Machinist,
1570 Old Colony Bldg., Chicago, Ill.

WANTED
One used 26-in.—42-in. McCabe 2 in. 1
LATHE
to take about 18 ft. between centers.
RODNEY HUNT MACHINE CO.
Orange, Massachusetts

POSITIONS VACANT

Canada

GLEASON Gear Cutting Machine Setter (straight and spiral). Gleason Grinder Machine Setter. Must be experienced men who thoroughly understand these machines. Apply, stating salary expected, to Employment Manager, McKinnon Industries Limited, St. Catharines, Ont.

DRAFTSMAN wanted for machine shop manufacturing water wheels and pumps. Must be a hustler and accurate. State education and experience, also salary expected. P-256, Am. Mach.

Connecticut

MECHANICAL engineer wanted; man with technical and practical knowledge of up to date mechanical methods to take charge of mechanical department in a large sheet metal specialty plant located in Connecticut. No application will be considered without full information of experience and references. State salary expected. P-259, Am. Mach.

FOREMAN for planer department. P-289, Am. Mach.

TOOL department foreman. Wanted a thoroughly capable executive with experience on tools for the manufacture of typewriters, adding machines, etc. Must have ability to design simple but good tools and be particularly well up on dies. A splendid opportunity for the right man. In reply give full details of your past career and salary desired. Connecticut. P-257, Am. Mach.

DRAFTSMAN with experience on steam turbines, engines or centrifugal pumps. Good opportunity for young man with initiative and ability. P-275, Am. Mach.

MECHANICAL draftsman wanted, experienced man on automatic machine design by a large sheet metal specialty plant located in Connecticut. No application will be considered without full information of experience and references. State salary expected. P-269, Am. Mach.

Delaware

SALES engineer and competent designer wanted on hydraulic machinery. Give full particulars in first letter. P-272, Am. Mach., Old Colony Bldg., Chicago.

A FOREMAN wanted for small accurate shaft grinding. Must be thoroughly experienced, with previous successful record. Location Middle West, long established electrical manufacturer. Act quickly. State experience definitely, and salary desired. P-4, Am. Mach., Chicago.

Immediate Delivery

5—24-in. Gisholt Turret Lathes, excellent condition.

2—No. 3 Brown & Sharpe Universal Grinders. Excellent condition.

2—No. 2 Brown & Sharpe Universal Grinders, excellent condition.

1—36-in. x 48-in. x 16-ft. Detrick & Harvey Open Side Planer, excellent condition.

1—48-in. x 14-ft. Enterprise Lathe, good condition.

1—24-in. x 12-ft. Schumaker & Boye Engine Lathe.

1—6-ft. Baush Plain Radial. Arranged for motor drive. Fair condition.

1—11-ft. Pond Vertical Boring Mill, with motor drive, first-class condition.

We Are in the Market for:

No. 0 Brown & Sharpe Grinders.
No. 4 Warner & Swasey Screw Machines.
24-in. Gould & Eberhardt Shaper.

Saxer Machinery Co., Erie, Pa.

FOR SALE

ROCK BOTTOM PRICES

IMMEDIATE SHIPMENT

1—No. 2A Warner & Swasey hollow hex. Turret Lathe.
1—No. 13 Brown & Sharpe spur and bevel Gear Cutter.
1—24-in. x 24-in. x 6-ft. Powell Planer.
1—24-in. Davis chucking Turret Lathe.
1—Reed-Prentice Semi-Automatic Lathe.
1—8½-in. x 16-in. Potter & Johnson Turret Chucking Lathe.
1—6-ft. Automatic Screw Machine Co.'s Turret Chasing Lathe.
1—No. 2½ Garvin hand Screw Machine, with wire feed.
3—2¼-in. Gridley Single Spindle Automatic, motor driven.
1—24-in. Kelley back geared Shaper.
1—No. 4 Bardons & Oliver Screw Machine, power feed to Turret Slide.
1—No. 4 Warner & Swasey power feed to Turret Slide.
1—16-in. x 6-ft. American Engine Lathe.
4—No. 7 Atkins Kwik-Kut power Hack Saws.
1—16-in. x 6-ft. LeBlonde Engine Lathe.
1—8-in. x 6-ft. Gardner Duplex Air Compressor.
1—6-in. x 6-in. Snyder-Hughes Air Compressor.
1—No. 20 Landis Grinder and Countershaft

Let us send you full description and our special prices. Write us your wants.

C. E. FALES MACHINERY CO.
Kerr Building, Detroit, Mich.

SECOND-HAND MACHINE TOOLS

1—24-in. x 12-ft. Double Back Gear Lathe with Turret, O. P. P. & P.
The above is a Greaves-Klusman Lathe.
1—36 x 36 x 20 D. H. Gray Planer
1—Grind Stone, 36-in. x 6-n. Stone
1—Crane Scale, 25,000 lb. capacity.
1—6-Ton Reading Hoist.
1—Birdsboro Belt Lacing Machine.
1—Sensitive Drill.

THE GREAVES-KLUSMAN TOOL CO.
Cincinnati, Ohio

TAPER PIN REAMERS

Immediate Shipment From Stock

Prices on Application

HYDE PARK MANUFACTURING COMPANY, Hyde Park, Mass.

Immediate Delivery

Used Machinery

2½-in. Industrial Works Horizontal Boring Mill.

60-in. Bullard Boring Mill, 2 swivel heads.

42-in. Gisholt, 1 turret, 1 swivel.

76-in. Bullard Boring Mill, 2 swivel heads.

6-ft. Gang Radial Drill.

32-in. x 18-ft. Bradford Lathe.

18-in. Canadian Machinery Corp. Slotter.

No. 7 Massillon single end punch and shear.

36-in. throat, arch jaws, capacity 1¼ in. thru 1 in. (new).

No. 4 Warner & Swasey Universal Screw Machine with a.c. and w.f.

No. 4—48-in. Brown & Sharpe Gear Cutter.

STOCKER-RUMELY-WACHS CO.
117-121 N. Jefferson Street, Chicago, Ill.

1—135 HP. Reeves vertical

GAS ENGINE

complete with gas regulator, gas reservoir, compressor, etc., also

1—100 HP. Land

GAS PRODUCER

This equipment is practically new, only used about six months. Full details upon request.

The Acme Machine Tool Company
Cincinnati, Ohio, U. S. A.

FOR SALE

2—1000-lb. E. W. Bliss Drop Forging Hammers.
5—21-in. LeBlond Lathes, equipped with 15-in. three-jaw Universal Chucks and taper attachments.
2—14-in. U. S. Sensitive Drills.
2—No. 1 Garvin Tapping Machines.
1—No. 2 Garvin Tapping Machine.
1—20-in. Sipp Sensitive Drill.
1—14-in. Girard Lathe.
1—J. A. Stowell Grinder, Saxon No. 2.
1—D-75 Ferracute Press, with outside cut-off.

RICHMOND FORGING CORPORATION
(Acca) Richmond, Va.

Tools for Immediate Shipmen

14-in. x 6-ft. Hamilton Lathe, h.s., comp. rest.
18-in. x 8-ft. Hamilton Lathe, dbl. bk.gr. New.
1½-in. S. & K. Hand Screw Machine.
1½-in. Wood Hand Screw Machine.
1½-in. S. & K. Hand Screw Machines (2).
16, 18 and 24 Barker Shaper, crank. New.
24, 24-in. x 6-ft. Sellers Shaper.
3½-in. Canedy-Otto Radial, plain. New.
4½-ft. Plain Radial. Baush.
Grand Rapids Grinder, Cutter and Reamer.
Miller No. 2 B & S, heavy, plain.
16-in. x 6-ft. Springfield Lathe, h.s., C.P.R. taper.
25-in. x 24-ft. Fifield Lathe.
20-in. x 16-ft. LeBlond Lathe, h.s., C.P.R.
2 x 24 and 3 x 36 J & L, double equipment.
22 x 22-in. x 6-ft. Gray Planer.
24 x 24-in. x 8-ft. American Planer.
26 x 26-in. x 8-ft. Niles Planer.
32 x 32-in. x 10-ft. Niles Planer.
Boring Mill, 10 ft., 2 swivel heads.
Boring Mill, 34-in. Colburn, 4-hole Turret Head.

THE OSBORNE & SEXTON MCHY. CO.
Columbus, Ohio

PLANERS

Hillis & Jones Plate Planer, No. 4 will cut 40 feet at one setting.

Pond Machine Co., 60-in. x 60-in. x 16-ft. Planer, 3 heads.

Cleveland Open side Planer, 42-in. x 12-ft. 2 heads.

Dietrick & Harvey Openside Planer, 36-in. x 8-ft. 2 heads.

John Moore Co., Planer, 38-in. x 38-in. x 10-ft. 1 head.

W. H. BOSWORTH
Commercial Bank Bldg., Cleveland, Ohio

CHEAP—Must Move

No. 5 Newton Milling Machine, B. G. vertical attachment.
Williams & White Welding Press.
Spoke Riveting Machine.
Justice Power Hammer.
A. D. T. ¾ Wire Straightener.
48-in. Car Wheel Borer.
4-ft. Bending Roll.
6-ft. Keene Brake.
15—No. 2½ Hendey Lincoln type Milling Machine.
24 x 24 x 6 Hendey Planer.
22 x 8 D. B. G. Engine Lathe.
20 x 14 S. B. G. Engine Lathe.
20 H.P. Vertical Boiler.
Several Air Compressors.
150-Ton Hydraulic Press.

A. M. STOEHR
512 North La Salle Street, Chicago, Ill.

No. 407a BLISS PRESS

Good as new **Immediate Delivery**

ZELNICKER IN ST. LOUIS

Only one of our Bargains
Get 60-page Bulletin before buying Rails, Cars, Locomotives, Machine Tools, etc.

Morris Machinery Co.

NEW AND USED

Machine Tools and Power Transmission

93-105 Chestnut St., Newark, N. J.

LATHES FOR SALE

Sebastian Engine Lathe, 14 in. 5 ft. between centers, 8 in. and 14 in. face plates, 4 speed countershaft, $300.

Blount Speed Lathe, 11 in. x 6 ft., $75.

Fairbanks Power Hack Saw, $35.

HERMANCE MACHINE CO.
Williamsport, Pa.

FOR SALE

Full Line of Machine Tools

Drawings, Patterns, jigs and templates, entirely up to date. On the market for 24 years. Good agents.

Apply Box 61, Station B, Cincinnati.

TOTE BOXES OF SHEET STEEL FOR SALE

SIZES

17⅞ in. x 9½ in. x 2 in.
18 in. x 10 in. x 2⅞ in.

Also Tote Boxes, racks and trays of White Pine. Attractive prices, especially to buyers of big lots.

RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES

711 Flatiron Bldg., New York City

TRIMMING PRESSES

Two Toledo No. 59¼ Double Geared, Straight Column Trimming Presses, with Friction Clutch. 6-in. Stroke. 95% New.

Russell Machine Co., Inc.
Pittsburgh, Pa.

WANTED

IMMEDIATELY

One

PHOTO-STAT MACHINE

Must be in perfect working order. Send photo and full description of make and price.

T. McAVITY & SONS, Ltd.
Box 700, St. John, N. B.

WANTED

Three, either of No. 1 or No. 1-H Vertical Spindle

Milling Attachments

for No. 1 Plain B. & S. Milling Machines.

THE LINOGRAPH COMPANY
Davenport, Iowa

WANTED—TANKS

4-4,000 to 10,000 gal. 1-25,000 to 50,000 gal.
1-55,000 Barrel or might use 2-30,000 Barrel

Describe fully and name lowest cash price in first letter

W239—American Machinist, 1570 Old Colony Bldg., Chicago, Ill.

Machine Tools Wanted

We shall at all times be glad to receive offers of second-hand machines in good condition, as we from time to time have demand for these from overseas.

ALFRED HERBERT, Ltd.
54 Dey Street, New York City
Head Office and Works: Coventry, England

WANTED
ONE ELECTRIC TRAVELING CRANE
Second-hand, 40-foot span, 10-ton capacity.
Sweet & Doyle Foundry & Machine Co.
Green Island, New York

WANTED
One each Nos. 14 and 30 Natco
HEAVY DUTY MULTIPLE SPINDLE DRILLS
Good condition or new.
Also all types Brown & Sharpe Automatics.
Carter Machinery Sales Co.
Buffalo, New York

WANTED
Used Cleveland Automatic
SCREW MACHINES
⅝-in.–⅞-in. Model B.
2-in. Model B.
Serial number above 16,000.
W316—American Machinist,
1570 Old Colony Bldg., Chicago, Ill.

WANTED
One used 26-in.—42-in. McCabe 2 in. 1
LATHE
to take about 18 ft. between centers.
RODNEY HUNT MACHINE CO.
Orange, Massachusetts

POSITIONS VACANT

Canada

GLEASON Gear Cutting Machine Setter (straight and spiral). Gleason Grinder Machine Setter. Must be experienced men who thoroughly understand these machines. Apply, stating salary expected, to Employment Manager, McKinnon Industries Limited, St. Catharines, Ont.

DRAFTSMAN wanted for machine shop manufacturing water wheels and pumps. Must be a hustler and accurate. State education and experience, also salary expected. P-256, Am. Mach.

Connecticut

MECHANICAL engineer wanted; man with technical and practical knowledge of up to date mechanical methods to take charge of mechanical department in a large sheet metal specialty plant located in Connecticut. No application will be considered without full information of experience and references. State salary expected. P-259, Am. Mach.

FOREMAN for planer department. P-289, Am. Mach.

TOOL department foreman. Wanted a thoroughly capable executive with experience on tools for the manufacture of typewriters, adding machines, etc. Must have ability to design simple but good tools and be particularly well up on dies. A splendid opportunity for the right man. In reply give full details of your past career and salary desired. Connecticut. P-257, Am. Mach.

DRAFTSMAN with experience on steam turbines, engines or centrifugal pumps. Good opportunity for young man with initiative and ability. P-275, Am. Mach.

MECHANICAL draftsman wanted, experienced man on automatic machine design by a large sheet metal specialty plant located in Connecticut. No application will be considered without full information of experience and references. State salary expected. P-269, Am. Mach.

Delaware

SALES engineer and competent designer wanted on hydraulic machinery. Give full particulars in first letter. P-272, Am. Mach., Old Colony Bldg., Chicago.

A FOREMAN wanted for small accurate shaft grinding. Must be thoroughly experienced, with previous successful record. Location Middle West, long established electrical manufacturer. Act quickly. State experience definitely, and salary desired. P-4, Am. Mach., Chicago.

POSITIONS VACANT

EMPLOYMENT

POSITIONS WANTED

POSITIONS VACANT

Illinois

DESIGNERS—Several first-class punch and die, jig and fixture and special machine designers wanted by a large manufacturing plant in Chicago. Permanent positions and exceptional opportunities for advancement to men who can qualify in the lines indicated. In answering state age, experience and approximate salary expected. Replies indicating applicants' fitness will be acknowledged promptly. P-265, Am. Mach., Old Colony Bldg., Chicago.

MAN wanted to act as assistant to superintendent of plant in Chicago, manufacturing a metal and wood product. Must be diplomatic in handling help and be able to maintain maximum output. A man with both technical and practical experience preferred. Salary $3000 with future. P-300, Am. Mach., Old Colony Bldg., Chicago.

TWO first-class all around practical machinists wanted. Preferably men who have had experience in time-study work and arranging progressive assembly and machining lines. Write or apply to The Buda Co., Harvey, Ill., (Chicago suburb.)

DESIGNERS, several first-class punch and die, jig and fixture and special machine designers wanted by a large manufacturing plant in Chicago. Permanent positions and exceptional opportunities for advancement to men who can qualify in the lines indicated. In answering, state age, experience and approximate salary expected. Replies indicating applicant's fitness will be acknowledged promptly. P-265, Am. Machinist, Old Colony Bldg., Chicago.

Indiana

SUPERINTENDENT wanted for machine shop on production work. Must be all around mechanic with practical knowledge of electricity. Give experience. P-307, Am. Machinst, Old Colony Bldg., Chicago.

Maryland

GENERAL foreman wanted for machine shop, and screw machine factory, excellent opening. P-306, Am. Machinist, 935 Real Estate Trust Bldg., Philadelphia.

Michigan

GAUGEMAKERS wanted on precision, spline, thread, built-up, snap, and plug gauges. Highest wages, ideal shop conditions, and no labor troubles. F. Jos. Lamb Co., 266 Jefferson Ave. E., Detroit, Mich.

TOOLMAKERS wanted, experienced on fixtures, cutters, dies and general repairs. Marble Arms & Mfg. Company, Gladstone, Mich.

WE are in need of a superintendent for our Michigan factory. We manufacture light stampings, and sheet metal parts for automobiles and trucks. Must be a good press man, have a thorough knowledge of all sheet metal work and have original ideas. Must take full charge of factory. P-302, Am. Mach., Leader-News bldg., Cleveland.

New York

ASSISTANT office manager. A Scandinavian machinery export house in New York City is in need of an energetic commercial man with technical experience, and about 30 years of age, to take care of Purchasing and Shipping Departments. Please state experience, qualifications, age and salary expected. V. Lowener, 114 Liberty St., New York.

POSITIONS VACANT

COMPETENT die-cutter wanted on hardware specialties. Small shop, good surroundings, live town. State age, experience, qualifications. Position permanent. Applications confidential. Niagara Falls Metal Stamping Works, Niagara Falls, N. Y.

WE have permanent positions for two first-class planer hands, ten bench hands, all around machinists and assemblers. Apply by letter to the American Assembly Machine Co., Croton Falls, New York.

ASSISTANT foreman for milling machine department in a large manufacturing concern in Central New York. Must have executive ability and some experience in producing small interchangeable parts in quantities. Permanent position and good opportunity for right party. Give experience, age and wages desired. P-258, Am. Mach.

GENERAL superintendent wanted for large foundry and machine works; good opening for right man. Must be thorough general machine shop man as well as first-class foundry men, with knowledge of general molding, loam molding and molding machine practice. P-299, Am. Mach.

MASTER mechanic wanted, general machine shop experience. Send letter outlining experience, references and full particulars. P-316, Am. Machinist.

A SCANDINAVIAN Machine tool import house has an opening with good opportunities for a Danish machinist who has thorough and detailed knowledge of all kinds of American machine tools. Only high grade, well-educated machinist with such experience, about 30 years of age and unmarried need apply. Applicant please state experience, age and salary expected in Danish Crowns. P-288, Am. Mach.

MECHANICAL engineer, graduate of two colleges, has had full charge of materials in large eastern shipyard recently closed, wants position with engineering or contracting company. Can handle men. Will go anywhere; age, 29. Salary, $70 per week to start. J. K. Smith, West Park, N. Y.

DRAFTSMAN wanted for detailing and tracing. Also machinists and toolmakers, who are first-class cornet, trombone or clarinet players. Attractive opening. Write at once. P-308, Am. Mach.

SET-UP man wanted for Potter & Johnson machines for new factory within 70 miles of New York City. Address, P. 303, Am. Machinist.

CHIEF tool designer wanted for factory manufacturing automobile starters. Give age, experience and salary wanted in first letter. Address, P-304, Am. Machinist.

TOOL designers with experience on automobile starter work, for factory within 70 miles of New York City. Give age, experience, and salary wanted in first letter. Address, P-305, Am. Machinist.

TOOL MAKERS BENCH MEN
EXPERT LATHE MEN

Splendid Opportunities for High-Grade Mechanics

The B. F. Goodrich Company
AKRON, OHIO

PRODUCTION MANAGER WANTED

A manufacturer of large power plant equipment needs a man to superintend the fabrication of its product, to supervise the buying and delivery of purchased accessory equipment, and to direct the erection of the apparatus—in other words, a man that will minimize time and cost between the receipt of an order and its delivery installed. A technically trained man will be preferred, and shop experience is necessary — but the big essential is a capacity for getting results in the least possible time. The job is as big as the right man can make it. Give all your experience and qualifications in your first letter, addressing

P-288, American Machinist,
Tenth Ave. at 36th St., New York City

POSITIONS VACANT

Ohio

A MAN capable of taking charge of production in machine shop, manufacturing a line of steam specialties; technical training desirable but not absolutely essential. Must be experienced both in shop and office ends. Position will be permanent and chances for advancement good. Location, small town in northern Ohio. Give experience in detail and salary wanted in first letter. P-284, Am. Mach., Leader-News Bldg., Cleveland.

Pennsylvania

TOOL designers wanted; those with typewriter or adding machine experience preferred. Good opportunity for the right men. State age and experience. P-287, Am. Mach., 935 Real Estate Trust Bldg., Philadelphia.

SEVERAL first-class toolmakers wanted, those experienced on jig, die and gauge work preferred. P-313, Am. Machinist, 935 Real Estate Trust Bldg., Phila.

MACHINE tool designer. Horizontal cylinder boring machine manufacturer wants draftsman and designer experienced on machine tool work. State age, experience, references and salary expected. P-112, Am. Mach., Phila.

Texas

DESIGNING Engineer Wanted—one experienced in designing farm implements. Prefer man capable of organizing and managing plant for quantity production at minimum cost. Plant located in large Texas city. Give full information regarding yourself, references, etc., in first letter and state salary expected. P-301, Am. Mach., Rialto Bldg., San Francisco.

PAINT FOREMAN WANTED

First class man who thoroughly understands painting from a manufacturing standpoint on high grade commercial truck bodies.

Must be a good executive, energetic, resourceful and good handler of men. State fully experience, past connections, reference, age, salary expected to start, and any other information which may be of value in selecting the right man. Splendid opportunity.

P317—American Machinist
935 Real Estate Trust Bldg.,
Philadelphia, Pa.

General Superintendent and Manager

for new Addressograph plant to be located in or near New York City, for manufacturing Addressographs and supplies. The position requires a man of unusual executive ability and a practical knowledge of light manufacturing and modern shop practice, as well as to thoroughly understand the handling of men and having an organization that will work in harmony and give efficient results. His records must show that he is a broad-gauged man and is equal to emergencies that arise.

First letter should give salary now receiving and experience for not less than past fifteen years, with references that will not be used until after a conference. Applications held in strict confidence and returned if requested. Apply by letter only.

ADDRESSOGRAPH CO., CHICAGO, ILL.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad. and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
657 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
501 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents—send copies.

EMPLOYMENT AGENCIES

CLEVELAND Engineering Agency, Rose Bldg., Cleveland, wants quickly experienced engineers, draftsmen and technical men available for executive, sales or engineering positions. Send stamp for blank and list of vacant positions.

AMERICAN Service Company, "National Employment Service at Your Command," Pittsburgh, Pa. Superintendents, plant engineers, chief draftsmen, master mechanics, tracing, detail and designing draftsmen for Eastern and Western employers. Fastest service most complete record, our reputation.

Employment Service

A SIGNIFICANT number of employers, and executives in positions of authority, who have had past opportunities to observe from the viewpoint of the employer the methods used by the undersigned; have afterwards become clients of this service themselves. Correspondence is invited from men qualified for positions between $2500 and $25,000 only. Negotiations strictly confidential and individual; conducted along lines of highest professional ethics. Established 1910. R. W. Bixby, 307 Lockwood Building, Buffalo, N. Y.

POSITIONS WANTED

FACTORY superintendent or general foreman. Expert in handling help and improving methods of production. Broad experience in manufacture of small to medium interchangeable parts requiring accuracy. American, age 38. Address PW-297, Am. Mach.

Indiana

RAILROAD man with 22 years' experience desires connection with a firm desiring a competent man to trace shipments in general. Can furnish best of references. Address C. C. Cochran, 1001 Heath St., Lafayette, Ind.

DRAFTSMEN

We need several who have had experience on Power Presses, Automatic Feeds or heavy machinery.

Future extension of departments offers prospect of advancement to men who can demonstrate ability.

If you are interested in making a place for yourself write us, giving references and details of experience.

Address Chief Engineer

E. W. BLISS COMPANY
Brooklyn, N. Y.

POSITIONS WANTED

Massachusetts

INSPECTOR and production follow-up man. Boston or vicinity. PW-123, Am. Mach.

New Jersey

DRAFTING work wanted at home or outside by mechanical engineer, former chief draftsman in large machine works; long shop experience; can assist developing ideas, supervise construction. Low charges. PW-260, Am. Mach.

General Factory Accountant

25, open for similar position. Eastern Jersey or N. Y. C. 6 years' experience in office work and accounting. Some experience costs, purchasing. Excellent references present employer. Salary $2000. PW-261, Am. Mach.

SUPERINTENDENT or executive, American, 40 years of age, 23 years in high grade factories, 8 years as an executive thoroughly experienced on quantity production of small and medium sized work having close limits; thorough mechanic, energetic, resourceful, member of A. S. M. E. PW-285, Am. Mach.

FIRST class tool and die man wishes position as toolroom foreman or factory superintendent with some reliable company. Location any part of the states of New York or New Jersey. PW-295, Am. Mach.

DIE CASTING MAN wants position. Has experience in all departments; can design dies and machines for white metal and aluminum and do estimating; good production manager and trouble man. PW-311, Am. Machinist.

New York

SALES engineer desires position, whole or part time for writing engineering or machinery catalogues, "write-ups," sales letters, "ads"; also taking photographs, 15 years experience engineering business promotion. J. H. L., 196 Westminster Road, Brooklyn, New York.

SUPERINTENDENT or assistant to plant engineer or similar; age, 34; 12 years' experience general plant maintenance, construction and general utility work; also experienced on operation and production work; familiar with commercial office details. PW-282, Am. Mach.

PRODUCTION superintendent having several years of executive experience in the engineering and suprvising the promotion of production work. References furnished. Compensation expected, $3500. PW-315, Am. Mach.

GENERAL or works manager wishes connection with progressive company, with opportunity to develop; age, 39; technical graduate; thorough shop and drafting experience; extended training in production, planning, routing and costs; past 10 years executive positions as superintendent, works and general manager; in charge manufacturing, production, purchasing, costs and engineering. At present also in charge of sales. Address, PW-280, Am. Mach.

MECHANIC, Swede; age, 33; experience in America: 1 year, machinist; 4 years, tool designer; 1½ years, chief tool designer. Experience abroad: 3 years, college; 2 years, machinst; 2 years, tool designer; 4 years, superintendent. PW-309, Am. Machinist.

PURCHASING agent; age, 28; eight years' experience in iron, steel, hardware, mill supplies; executive ability; competent, reliable, good correspondent, systematic; acquainted with sources of supply. Will locate anywhere. PW-310, Am. Machinist.

Pennsylvania

SUPERINTENDENT or factory manager experienced executive, familiar with modern methods and shop practice, with record in increased production and decreased costs, A1 mechanic with technical education, well up on tools, jigs and fixtures. PW-253, Am. Mach., Phila.

AGENTS AND SALESMEN

Representation on Pacific Coast

Demobilized Army Officer, ten years' business experience, resident of California for several years, would like to represent manufacturing or jobbing concern on Pacific Coast. Has some means to invest if required. Address W. P., c/o The Chas. A. Strelinger Co., Detroit, Mich.

Do You Want Representation in France?

French engineer, graduated Arts and Metiers, having offices in Paris, well acquainted with the following industries: forging, stamping, drawing, shearing, bolt making, leaf-spring manufacturing, seamless tubing, wants representation of American concerns building special machinery concerning these lines. Can arrange to buy licenses to make such machines in France. Send all offers to Mr. Pierre Degorce, 23 Rue Ballu, Paris, France.

WE have an exceptional proposition for salesman visiting machine shops and machinery supply houses, to handle our line as a side line on commissions. We carry accounts and pay your commissions regularly as accounts are paid. Our line covers small efficiency tools which cause great enthusiasm wherever shown. Full particulars and illustrations of the devices will be sent by applying to Ef. D. C., 199 8th Street, Long Island City, N. Y.

SMALL-TOOL salesman wanted for Central New York territory, one familiar with drills, cutters, taps, dies, etc. Apply, giving age, references, experience and salary expected. AS-281, Am. Mach.

Shop Agents and Mechanics Wanted

To sell Brown & Sharpe, Starrett, Goodell-Pratt and Slocomb tools, also steel and wood tool chests of the best makes. Excellent pay and unlimited opportunities. One man per shop. Send for large catalog and agency proposition today. Chas. E. Tucker & Son, York, Pa. (Known the world over as "The Tool King.")

MACHINE tool salesman in the New York district. A real opportunity for a real man to connect with a "live" and progressive dealer. Address with full details in confidence to AS-233, Am. Mach.

Side Line Salesman Wanted

to sell complete line of "Wedge" toolbit holders. Sells at sight. Good commission. Chamberlain Machine Works, Waterloo, Iowa.

SALES representative in New York City, both foreign and domestic, by tool machine manufacturers of various products. Man with practical experience preferred. In reply state if French or Spanish spoken and salary desired. AS-296, Am. Mach.

SALES organization wanted, to represent manufacturer of well known machine. Write stating particulars. Only A No. 1 concern will be considered. AS-298, Am. Mach.

AGENTS AND SALESMEN

MAN with machine shop experience and knowledge of practical use of twist drills, milling cutters, reamers, taps and dies to introduce and sell same to machine shops. State age, experience, references and wages expected. Address "Reckutaw," P. O. Box 5, Station S, New York, N. Y.

SALEMEN to demonstrate and sell motor driven portable thread grinding machine. Must have had tool and gage making experience. Locations, Boston, Chicago, Cleveland, Detroit, Indianapolis, Philadelphia and St. Louis. Give experience, reference and minimum salary. Address, Sales Manager, Precision & Thread Grinder Mfg. Co., 1932 Arch St., Philadelphia, Pa.

SALESMAN for a progressive tool engineering concern in New York City to sell on a salary and commission basis. Applicant must be well acquainted in metal manufacturing line and know production methods. To one who can show results this position offers excellent possibilities. Give full particulars in first letter. All information treated strictly confidential. AS-312, Am. Machinist.

A MANUFACTURER of a machine shop necessity desires a sales representative who has the organization and is financially able to distribute this article over the United States. AS-314, Am. Machinist.

WANTED

Back Issue Wanted

A number of copies of the August 1, 1918, issue of American Machinist are needed to complete my files. For a limited time 30c. per copy will be paid. Send your copy today addressing to L. Leight, c/o McGraw-Hill Company, Inc., Tenth Avenue at 36th Street, New York City.

MISCELLANEOUS

Inventions

IF you have a practical invention, write us about it. We can help you work out details; make drawings, models, dies and special machines; secure patents and manufacture the goods under contract or on royalty. Adam Fisher Mfg. Co., 215 St. Louis, Mo.

BUSINESS OPPORTUNITIES

Business Opportunities

Owing to age and poor health I have a business and a fine opportunity for a young man with business ability to take over a metal goods manufacturing plant; about $3000 dollars needed, balance in small monthly payments, address owner, Box 47, Chatham, Conn.

FOR SALE

A Machine Forge and Tank Shop

For sale. Now doing a good business; reason for selling death in family. Terms can be agreed upon. For further information write E. P. Jordan, 268 Atlantic St., Stamford, Conn.

Modern Plant Wanted

equipped for manufacture of small interchangeable parts. Location preferred—New Jersey. Give full particulars.

BO293 American Machinist
10th Ave. at 36th St., New York City.

MACHINE SHOP

fully equipped, all modern tools and machinery, doing high class work, good trade and money maker; located best city in Canada; obliged to sell at bargain price due to other interests. Bears investigating. Principals only considered.

BO246—American Machinist,
10th Ave. at 36th St., New York City.

MACHINE SHOPS FOUNDRIES MANUFACTURING PLANTS

sold or exchanged on reasonable commission. No exclusive contracts required. Strictest confidence. Partnerships arranged or capital procured. Size or distance no object. Call or write

WESTON & COMPANY
1440 Broadway, New York City

Important:

"Up-to-the-Minute" Advertising

ALL advertisments in this SEARCHLIGHT SECTION are of CURRENT needs.

ALL advertisements received right up to the time of closing for press are included in this issue.

Contract Work

SEE OUR DISPLAY
at the
NEW YORK TRUCK SHOW
EIGHTH COAST ARTILLERY ARMORY
194th St. and Jerome Ave. (Take Jerome Ave. Subway)
Remember—January 1 to 10

SERVICE ENGINEERING Co
New York 25 Church St.
Detroit, Mich. 906 Majestic Bldg.

WRIST PINS
IN QUANTITY PRODUCTION
Interchangeable Machine Parts
Get Our Prices
LINCOLN MACHINE CO.
PAWTUCKET, R. I.

A. L. DE LEEUW
Consulting Engineer
Designs of standard and special machine tools and of automatic machinery.
Jigs, fixtures, tools and tool layouts.
Planning of machining operations.
Layouts of new or enlarged plants.
149 Broadway, New York

Our Shop is at Your Service
FOR
Jigs—Fixtures—Ring, Plug and Snap Gauges—Blanking—Piercing—Drawing—Forming and Sub Press Die Work—Special Machine Work.
Send Blueprints for Estimates.
THE COLUMBUS DIE, TOOL AND MACHINE COMPANY
COLUMBUS, OHIO

Let Us Bid
We are again in a position to take orders for special and contract work, etc.
With additional equipment we are now more than ever able to give our patrons the benefit of our experience.
Send blueprints today.
Blair Tool & Machine Works, Inc.
521 Greenwich St., New York

WE CAN DO BUSINESS WITH YOU
Ask for quotations on

Complete Assemblies—	Wood Work
Machine Work	Blacksmith Work
Tool Room Work	Drop Forgings
Sheet Metal Work	Heat Treating

No Job Too Large or Too Small for Our Attention
BUFFALO PITTS COMPANY, Buffalo, N. Y.

Accurate Screw Machine Work
The ATLANTIC MFG. CO.
Milford Conn.

FROM DRAFTING ROOM TO FINISHED PRODUCT

We are equipped to receive your work in "drafting room form," perfect it and return it to you in finished form.

Is there anything you need in the way of Tools, Fixtures, Gauges, Jigs or Special Machines?

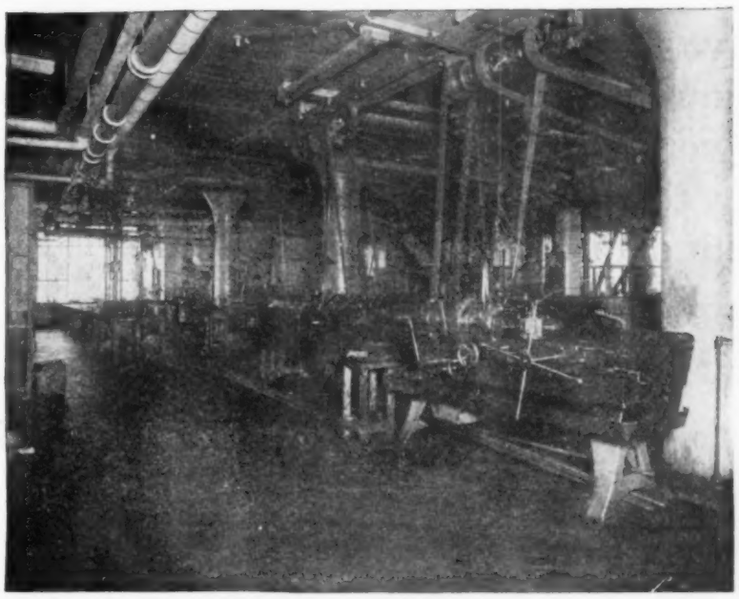
We give an absolute guarantee that our work will be thoroughly satisfactory. Can we be of assistance?

P. A. Geier Co.

Cleveland, Ohio

GEIER

Have Them Made Here



Screw Machine Work, Tools, Dies, Jigs, Fixtures

Let us quote you on your *hand screw machine work.* We are equipped to do work to very close limits. Machines for 5/8 in. to 2½ in. capacity.

We also have facilities for the manufacture of all kinds of dies, jigs, fixtures, and are prepared to take orders for a specified delivery date. We guarantee to make delivery as promised.

Quality Work—Prompt Delivery—Fair Price

Write Us

Arthur Brock, Jr., Tool & Mfg. Works
533 North 11th Street, Philadelphia, Pa.

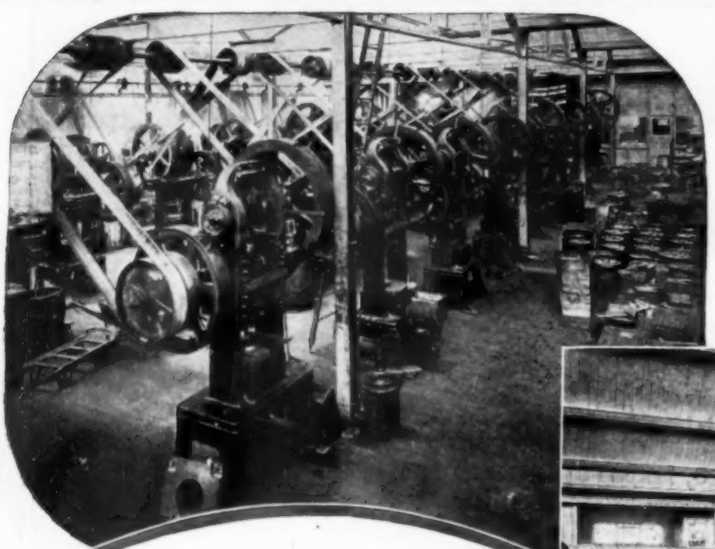
Here's Your Chance

We Want To Make Connections with Plants Equipped To Handle Screw Machine Work

We have a good assignment to place with some plant equipped to handle automatic screw machine work. If you can handle such work write us today asking for blueprints and more complete details.

DAVIS BORING TOOL COMPANY
3735 Forest Park Blvd. St. Louis, Mo.

We've Got Work For You



STAMPINGS

We are now ready to do all kinds of Stamping on contract. Our big plant, all our machinery and many experts await your command.

We can handle heavy and light stampings. Steel in stock from No. 28 gauge to ¼ inch. Prompt deliveries assured. Prices right.

Drop us a line today, telling us your needs.

The Acklin Stamping Co.
Toledo, Ohio

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Krasberg

A Business Built on the Success of Others

THE fact that the Krasco Plant, during its years of operation, has become one of the largest of its kind in the country is not due to shrewd business dealings. It is attributable to one thing alone, and that is because Krasberg has grown with his customers.

They had entrusted him with the complete manufacture of their products. It was up to Krasberg to produce great quantities of special tools of all descriptions—establish a standard of quality, and keep it there.

Then as the demand for these products grew, Krasberg found it necessary to enlarge his plant and increase his equipment, in order to take care of the growing demand for his customers' products and his services.

Right now the Krasco Plant is building an addition which will contain 130,000 square feet of floor space. Co-operation, dependability, and fair, honest dealing have made those who have heretofore taken advantage of Krasco Service perpetual customers.

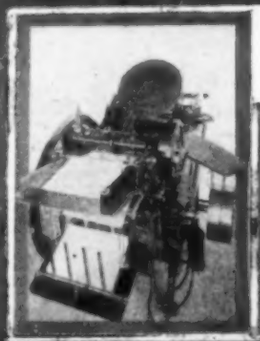
The Engineering Department of the Krasco Plant will welcome any inquiry you see fit to make with regard to manufacturing problems. Quotations on production will be submitted, if you desire, upon receipt of samples or blueprints of anything mechanical.

Krasberg Engineering & Manufacturing Corp.
536 Lake Shore Drive
CHICAGO

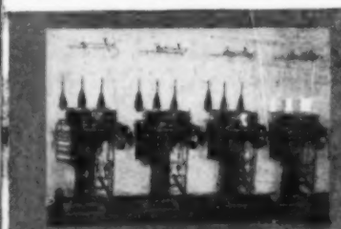
KRASCO

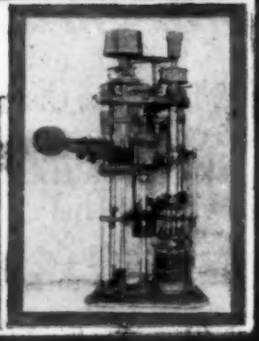
COWDREY

CONTRACTORS SPECIAL
BUILDERS AND
DESIGNERS OF MACHINERY



Delicate laboratory instruments, intricate knitting machine mechanism. Special machines of *any* description, but built in *one* style—the best The years of experience back of our large force will save you money.





Founded 1875

C.H.COWDREY MACHINE WORKS
19 · SUMMER ST., FITCHBURG, MASS., U.S.A.

Their unfailing ability to live up to their reputation of predominance is what promotes the nation-wide popularity of

Corbin Automatic Screw Machine Products

Quotations gladly and promptly furnished on receipt of specifications, samples or blueprints.

Let us know your needs.

CORBIN SCREW CORPORATION
American Hardware Corporation
Successor
New Britain, Conn.
BRANCHES:
New York Chicago Philadelphia

LET US DESIGN AND BUILD
YOUR
TOOLS, DIES JIGS and FIXTURES
All work guaranteed
THE BUDD-RANNEY ENGINEERING CO.
COLUMBUS, OHIO

Screw Machine Products

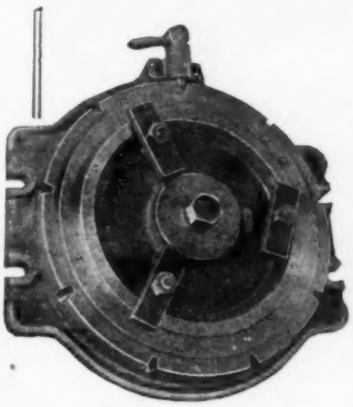
Flat Turret Lathe Work, Bar Stock Capacity 3-in., Chucking Capacity 18-in. We specialize in manufacturing Automobile and Machine Parts, Spur, Bevel, Gears and Sprockets.

Let us figure on your requirements. Prompt deliveries; Reasonable Prices.

ZUMBACH MACHINE CO.
134-136 West 54th Street, New York City

TOOL TRADE MEHL MADE MARK SERVICE

Put It Up To Men Who Know Your Problems



In every industry there are problems common to all companies engaged in the particular line of work. The Mehl staff of tool designers, besides being exceptionally well-versed in the general subject of tool designing and building are by experience fitted to wrestle with the particular problems of the automotive manufacturer.

Mehl-made Tools are proved-in-service production boosters—made by men who know how. It's this "know how" that makes Mehl-made Tools so sure of results."

The Mehl Tool Prospectus outlines our service, contains valuable tool data, and proves the value of Mehl-made Tools.

Send for your copy TODAY—
IT'S FREE.

To MEHL MACHINE TOOL & DIE CO.
Roselle, New Jersey
Send me my copy of your new tool prospectus.
Name. .....
Position. .....
Company. .....
Address. .....

Mehl Machine Tool & Die Co.
Roselle, N. J., 30 Minutes from N. Y. C.

It's this type of modern factory that you want to turn-out your

FINE WORK

Address Box CW292—American Machinist, if you want the proper type of plant to handle that fine work for you. Unexcelled equipment—thoroughly trained workmen—progressive methods of production, all this can mean one thing—absolute satisfaction.

Write today and your inquiry will go forward at once

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36th Street at 10th Avenue, New York City

FRANKLIN MACHINE CO.
Engineers, Founders and Machinists
PROVIDENCE, R. I.

Iron Castings, Shafting, Hangers, Pulleys, Etc. Special Textile Machinery, Heavy Machinery for Steel, Rubber and Paper Mills

and

THE HARRIS-CORLISS STEAM ENGINE

Screw Machine Products

Work up to 2¼ in. diameter can be handled with our increased facilities. Send us your specifications.

THOS. H. DALLETT CO., Philadelphia, Pa.

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Screw Machine Products

Prompt deliveries.

Shop fully equipped with highest class new machines

Estimates cheerfully furnished.

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Moore Drop Forgings

Reflect the Reputation of their Makers

MOORE DROP FORGING CO.
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Special Reamers and Arbors, Spot Facing Tools, Forming Tools, high speed or carbon—as you like them. From our Small Tools Department.

Mail that order for Tools, Dies, Jigs, Fixtures, to

American Tool & Manufacturing Co.
Urbana, Ohio, U. S. A.

ACCURACY EFFICIENCY

Gauges Tools Dies

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Special Machinery

ROBBINS, GAMWELL & CO.
Pittsfield, Mass.

We specialize in the manufacture of

Dies, Jigs, Fixtures and Gauges

special machinery and tool designing. We solicit your inquiries. Send us blueprints and let us quote you.

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TOOL DIE MACH. CO.

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Designers and Builders of

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TOOLS — GAUGES
DIES — FIXTURES

SCREW MACHINE WORK

SPECIAL PARTS TURNED FROM BRASS, STEEL AND IRON

ERICSSON SCREW MACHINE PRODUCTS CO., INC.
607-609 BERGEN STREET, BROOKLYN, N.Y.

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GET OUR PRICES

Sheet Metal Stampings, Brass, Bronze, Copper, Steel or Aluminum. Any size up to 4 in. x 6 in. Any quantities. Prompt shipment.

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E.G.MUNSON, Utica, N.Y.
GREY IRON CASTINGS
PATTERN WORK (Wood & Iron)
MACHINE WORK

The building and mounting of patterns for moulding machines a specialty.

QUICK DELIVERY ON MILLING CUTTERS

End Mills, Mandrels, Dies, Jigs, Fixtures and special tools of all kinds.

Our 25 years' experience is your assurance of quality and service.

CHAS. J. MOODY TOOL WORKS
60-62 River St., Elgin, Ill.

SPECIAL MACHINERY
BUILT TO ORDER

We have splendid facilities for producing special machinery of all kinds, and are prepared to guarantee satisfaction—both as regards workmanship and price. We have foundry facilities and an up-to-date machine shop. Send us blue-prints and give us an opportunity to quote you price. We can save you money.

Lambert & Todd Machine Co., Camden, N. J.

PLACE THIS PHOTOGRAPH IN YOUR CATALOG

This is part of your own organization. It's the plant that turns out your special machines and tools—your jigs, dies, fixtures and automatic machinery—your quantity production.

At this plant we not only produce the thing you sell but we improve your original proposition, and show you how you can save money on its production. Of course you can insert this picture in your catalog. It's part of your organization. Others are doing it.

SLOCUM-AVRAM-SLOCUM MANAGEMENT

Have you some project in mind that needs special tools or machinery to make it? Have you extra work in your factory that overtaxes your facilities? In either case drop us a line.

SLOCUM, AVRAM & SLOCUM LABORATORIES INC.

Works: Newark, N. J.
N. Y. Office: Woolworth Bdg

High-Class Gauge Work → **For 18 Years** we have been manufacturing them—precision, careful workmanship and excellent material have been our watchwords. Write for information. ← Accurate Punches and Dies

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Machine Contract Work Wanted

Dies—Jigs—Tools

Special Machine parts in quantities
Experimental Work Patents and Models

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WHEN YOU NEED ANY
Experimental Apparatus in the Development of Your Product, Special Machines Needed in the Manufacture of Your Output, Jigs, Fixtures or any kind of High Grade Machine Work,
I HAVE
Machine Tools, Expert Workmen and Engineers at Your Service.

Tel. Stamford, Conn. **A. H. EMERY** Glenbrook, Conn.

FORGINGS

That save you money in machining and finishing. From a few to 10,000 pounds
Write us today.

THE JOHNSTON & JENNINGS CO.
Cleveland, Ohio, U. S. A.

Satisfaction Guaranteed

We guarantee to please you in the building of your special machinery. Prompt delivery. Quality work. Prices that are right.

What are your wants?

The Steel Products Engineering Co., Springfield, O.

JIGS—GAUGES—FIXTURES

Piercing and Blanking Tools.
Die Sinking and Engraving.
Metal Stampings to Order.

Our Tools Must Pass the Johansson Test.

THE FEENEY TOOL COMPANY
751 Central Ave., Bridgeport, Conn.

Refined Malleable Castings

LANCASTER FOUNDRY CO.
Lancaster, Penna.

Tools Gauges — THE — Special Cutters

E. W. CARPENTER MFG. CO.

Jigs Fixtures — Bridgeport Conn. — Special Machinery

SPECIAL TOOLS

We manufacture Dies, Jigs, Gages and Special Machinery. Let us quote you on your requirements.

Commercial Engineering Co.
627 Engineers Bldg., Cleveland, Ohio

One of the most progressive plants in the U. S. A. to handle your

FINE WORK

You require a plant up-to-date in methods and equipment and men of long training to produce that fine work for you in large quantities. To get the work done economically too, requires a shop which is up-to-the-minute in every particular.

If you want absolute satisfaction and quick deliveries address

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Tool Room Work of the better class

and the building of special machinery and parts s our business.

The Hartford Special Machinery Co
Hartford, Conn

Machine Contract Work
WANTED

Thoroughly equipped with modern machine shops, we can render prompt and efficient service.
Special Machinery Building and Contract for Parts Solicited.
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Wood and Metal

Sweet & Doyle Fdry. & Mch. Co.
Green Island, Albany Co., N. Y.

Special Machinery Tools, Jigs Fixtures, Etc.

Designed and built for all purposes, light or heavy.

Light Automatic Machinery a Specialty.

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HEAVY CASTINGS

With unexcelled equipment for the economical handling of heavy gray iron castings, this foundry is at your service. Good castings in quick time.

Wire—write—or phone

THE JAMES A. BRADY FOUNDRY CO.
4508 Western Ave., Chicago

If you are in that vicinity so much the better, but whether you're near or far we can show you results on Contract Work or manufactured parts and special machines.

We are also equipped to do medium and heavy Planing, Boring, Turning, and J. & L. Screw Machine work. Write for information to the

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with first-class equipment can take additional work for 18-in. or 20-in. Lathes, 42-in. or 72-in. Boring Mills, and shaper work.

Address Box 710 Rochester, N. Y.

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Forming, Blanking and Drawing
Jigs—Fixtures

SUPERIOR TOOL & DIE WORKS
313 So. Clinton St., Chicago, Ill.

BRASS SCREW MACHINE PRODUCTS

Ranging from ¼ in. to 2½ in. diameter. We have large and excellent facilities, and if it can possibly be made on a screw machine, we can make it. Send us your blueprints or samples and we will quote you prices.

ANSONIA MFG. CO., Ansonia, Conn., U. S. A.

DODGE QUALITY SERVICE TOOLS

Special—
Tools
Gauges
Fixtures
Jigs
Dies

Special—
Service
Quality

DODGE TOOL CO.
Grinnell, Iowa

Unload that extra heap of work—Unload it onto the shoulders of the man who can handle it—You can find that man in the

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WANTED
Work for Jones & Lamson Machines, Also Plain Lathe Work

We can take on a quantity of
JIG, FIXTURE, GAUGE AND DIE WORK FORMED CUTTERS —SPECIAL MACHINERY

We were the largest producers of thread gauges for the U. S. Government during the War and one of the largest producers of jig and fixture work for the various munition makers during the same period.

Can We Serve You?

MASTER THREAD GAUGES

Jigs, Fixtures, Formed Cutters, Special Machinery

H. W. COTTON, Inc., Woolworth Building, New York
Works: Brooklyn, N. Y.

SMALL PARTS OR UNITS

Electrical and mechanical job work or contract work.

Special attention given to Model Development—Experimental Work.

BISHOP MACHINE CO., 25 Barclay St., New York City

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COLUMBUS BRASS CO.
COLUMBUS, OHIO

Intricate Light Metal *STAMPINGS*

We also manufacture all kinds of
TOOLS, DIES, GAUGES, FIXTURES as well as SPECIAL MACHINERY AND PARTS

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AUTOMATIC
Screw Machine Products
Stampings and Castings
Machine Work
Wire and Metal Work
Special Machinery
Complete Assemblies

Union Manufacturing Co.
116 Humboldt St.
Union Hill, New Jersey
Low Overhead

Ready for Shipment—

Large stock of thread gauges of all standards for prompt shipment. Special gauges quickly made. Tool work and dies of all kinds.

Guaranteed accurate. What do you need? Anyway, write today for our Gauge Catalog.

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Bridgeport, Conn.

CYLINDRICAL
GRINDING
HEAT TREATING
PARTS MANUFACTURERS.
COMPLETE EQUIPMENT
MAIL ENQUIRIES.

GENERAL MACHINE WORKS
YORK, PA.

Quality Screw Machine Products

of all varieties milled from the solid bar. Detailed announcement in last week's issue.

Hartford Machine Screw Co.
Main Office and Works: **Hartford, Ct.**

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LET REAL TOOLMAKERS

Help You Tool Up For Your Manufacturing

Organization, Modern Equipment *and* Manufacturing Facilities

FOR QUANTITY PRODUCTION

Marf Machine Co., 17 Vandewater St., N. Y.

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wishes to get in touch with shops within 100 miles of New York City, with facilities to take up the manufacturing of parts. Can use work from foundries, screw machine, forging, machine work, heavy press steel, stamping and similar lines.

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For Alphabetical Index See Last Page

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Carborundum Co., Niagara Falls, N. Y.
Gardner Machine Co., Beloit, Wis.

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Cutter & Wood Supply Co., Boston, Mass.
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Gardner Machine Co., Beloit, Wis.
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grinding Wheel Corp., Chester, Mass.
Norton Co., Worcester, Mass.
Safety Emery Wheel Co., Springfield, Ohio.
Vitrified Wheel Co., Westfield, Mass.

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Elmes Engineering Wks., Chas. F., Chicago.
Watson-Stillman Co., 42 Church St., N. Y. City.
Worthington Pump & Mchy. Corp., N. Y. City.

Air Lifts
Ingersoll-Rand Co., 11 Broadway, N. Y.
Sullivan Machinery Co., Chicago, Ill.
Worthington Pump & Mchy. Corp., N. Y. City.

Air Purifiers and Coolers
Worthington Pump & Mchy. Corp., N. Y. City.

Analyses, Chemical
Souther Engineering Corp., Hy., Hartford, Conn.

Angle Plates
Boston Scale & Machine Co., Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Anvils
West Steel Casting Co., Cleveland, Ohio.

Arbors
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, O
Cochrane-Bly Co., Rochester, N. Y.
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
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Auburn Ball Bearing Co., Rochester, N. Y.
Boker & Co., H., 101 Duane St., N. Y. City
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hoover Steel Ball Co., Ann Arbor, Mich.
New Departure Mfg. Co., Bristol, Conn.

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Royersford Fdry. & Mach. Co., Royersford, Pa.
Whiting Foundry Equipment Co., Harvey, Ill

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Gisholt Machine Co., Madison, Wis.
Marvin & Casler Co., Canastota, N. Y.
Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Williams & Son, E. A., Jersey City, N. J

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Graham Roller Bearing Co., Coudersport, Pa.
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New Departure Manufacturing Co., Bristol, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
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Bunting Brass & Bronze Co., Toledo, Ohio.
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Bearings, Journal
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Mass, Oilless Bearing Co., Worcester, Mass.
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Brown Mfg. Co., Arthur S., Tilton, N. H.

Belting, Fabric
Rossendale-Reddaway B. & H. Co., Newark, N. J.

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Ladew Co., Edw. R., Glen Cove, N. Y.
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Williams & Sons, I. B., Dover, N. H.

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New Britain Machine Co., New Britain, Conn.

Benches, Work
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Machine Co., New Britain Conn.
Western Tool & Mfg. Co., Springfield, Ohio.

Bench Legs
Brown & Sharpe Mfg. Co., Providence, R. I.
Garwood Bronze & Iron Works, Garwood, N. J.
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Machine Co., New Britain, Conn

Bending Machines, Power
Baird Pneumatic Tool Co., Kansas City, Mo.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

Blocks
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Blocks, Chain (See Hoists, Hand)

Blocks, Die
Halcomb Steel Co., Syracuse, N. Y.

Blocks, Pillow
Gurney Ball Bearing Co., Jamestown, N. Y.

Blowers
American Gas Furnace Co., 24 John St., N. Y. C.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Blueprinting Machinery
Buckeye Engine Co., Salem, Ohio.
Wickes Bros., Saginaw Mich.

Blueprints
Wickes Bros., Saginaw, Mich.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Newton Mach. Tool Wks., Philadelphia, Penn.
Universal Machine Co., Bowling Green, Ohio.
Victor Tool Co., Waynesboro, Penn.

Bolts and Nuts
Hartford Machine Screw Co., Hartford, Conn.
National Acme Co., Cleveland, Ohio.

Bone for Case Hardening
Rogers & Hubbard Co., Middletown, Conn.

Books, Technical
McGraw-Hill Book Co., 239 W. 39th St., N. Y. C.

Boosters
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Boring and Turning Mills, Vertical
Betts Machine Co., Rochester, N. Y.
Bickford & Co., H., Lakeport, N. H.
Bullard Machine Tool Co., Bridgeport, Conn
Cincinnati Planer Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Penn.
Gisholt Machine Co., Madison, Wis.
Newton Mach. Tool Wks., Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Rogers Machine Tool Co., Salamanca, N. Y.
Sellers & Co., Wm., Philadelphia, Penn

Boring, Drilling and Milling Machines, Horizontal
Barnes Co., W. F. & John, Rockford, Ill.
Bansh Machine Tool Co., Springfield, Mass.
Beaman & Smith Co., Providence, R. I.
Betts Machine Co., Rochester, N. Y.
Cleveland Mach. Tool Co., Cleveland.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Dale-Brewster Machinery Co., Chicago, Ill.
Defiance Machine Works, Defiance, Ohio.
Gidding & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Lucas Machine Tool Co., Cleveland.
Moline Tool Co., Moline, Ill.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Pedrick Tool & Machine Co., Philadelphia.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sellers & Co., Wm., Philadelphia, Penn.
Springfield Machine Tool Co., Springfield, Ohio.
Universal Boring Machine Co., Hudson, Mass.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

Boring, Drilling and Milling Mach., Vertical
Betts Machine Co., Rochester, N. Y.
Cochrane-Bly Co., Rochester, N. Y.

Boring Heads
Davis Boring Tool Co., St. Louis, Mo.
Marvin & Casler Co., Canastota, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waterston, J. M., 77 Woodward Ave., Detroit

Boring Tools
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence, R. I.
Davis Boring Tool Co., St. Louis.
Hall Mfg. Co., Abington, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Kelly Reamer Co., Cleveland, Ohio
Lovejoy Tool Co., Springfield, Vt.
Parker Machine Co., 221 High St., Boston
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn

Boxes, Tote (See Furniture, Machine Shop)

Broaches
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
La Pointe Co., V. E., Manchester, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Broaching Machines
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
La Pointe Co., V. E., Manchester, Conn.

Bronze
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Williams & Son, E. A., Jersey City, N. J.

Bronze, Phosphor
Bunting Brass & Bronze Co., Toledo, Ohio.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

Bucket Carriers, Pivoted
Link-Belt Co., Chicago, Philadelphia.

Buffing or Polishing Machine (See Polishing and Buffing Machines)

Bulldozers
Toledo Mach. & Tool Co., Toledo, Ohio.

Burners, Oil and Gas
Baird Pneumatic Tool Co., Kansas City, Mo.
Best, W. N., 11 Broadway, N. Y. City.
Gilbert & Barker, Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

Bushings
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Williams & Son, E. A., Jersey City, N. J.

Cabinets, Tool
Armstrong Bros. Tool Co., Chicago.
Lyon Metallic Mfg. Co., Aurora, Ill.

Calipers
Athol Machine Co., Athol, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Randall & Stickney, Waltham, Mass.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

Cam Cutting Machines
Cochrane-Bly Co., Rochester, N. Y.
Garvin Machine Co., N. Y. City.
Rowbottom Machine Co., Waterbury, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Use of Decarbonized Steel Prevented by Hoover Laboratories

Steel, like human beings, varies in its characteristics.

But unlike human beings, its differences are less easily detected.

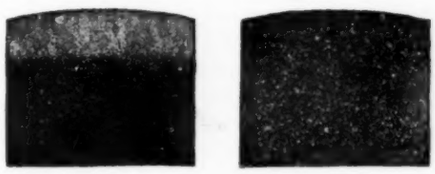
Decarbonized steel because of its softness, lacks a high degree of elasticity, so that when it is subjected to pressure it loses its shape long before the rupture point is reached.

Despite the most exacting visual inspections, which are rigidly maintained in the Hoover plant, it would be quite possible for balls with decarbonized surfaces to escape detection.

The matter was put up to the Hoover Research and Control Laboratories.

A clever application of a well known law of physics solved the difficulty.

Thus one more test was added to the long list upholding the tradition of Hoover Reliability.



1 2

Photograph 1 shows highly magnified section of wire or bar (from which ball is made) with decarbonized surface. Photograph 2 shows section of bar with no decarbonization. Obviously, only the latter can be fabricated into perfect balls. This is another example of the important function of the Hoover Laboratories.

Hoover Steel Ball Company

Ann Arbor, Michigan

HOOVER

STEEL BALLS

Cams
Rowbottom Machine Co., Waterbury, Conn.

Can-Making Machinery (See Sheet Metal Working Machinery)

Castings, Aluminum
Acme Die Cast. Corp., Bush Ter. 3, Brooklyn.
Bunting Brass & Bronze Co., Toledo, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Light Mfg. & Foundry Co., Pottstown, Penn.
Stewart Mfg. Corp., Chicago, Ill.

Castings, Brass and Bronze
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Imperial Brass Mfg. Co., Chicago.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.
Pangborn Corp., Hagerstown, Md.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Stewart Mfg. Corp., Chicago, Ill.
Williams & Son, E. A., Jersey City, N. J.

Castings, Die Molded
Acme Die Cast. Corp., Bush Ter. 3, Brooklyn.
Doehler Die Castings Co., Brooklyn, N. Y.
Franklin Mfg. Co., Syracuse, N. Y.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.
Marf Machine Co., 17 Vandewater St., N. Y. C.
National Lead Co., 111 Broadway, N. Y.
Precision Castings Co., Inc., Syracuse, N. Y.
Stewart Mfg. Corp., Chicago, Ill.

Castings, Iron
Athol Machine Co., Athol, Mass.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Brady Foundry Co., Jas. A., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Caldwell & Son Co., H. W., Chicago, Ill.
Farrell Foundry & Machine Co., Ansonia, Conn.
Franklin Machine Co., Providence, R. I.
Lancaster Foundry Co., Lancaster, Pa.
Munson, E. G., Utica, N. Y.
Springfield Mach. Tool Co., Springfield, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.

Castings, Nichrome
Driver-Harris Co., Harrison, N. J.

Castings, Semi-Steel
Farrell Fdy. & Mach. Co., Ansonia, Conn.
Pangborn Corp., Hagerstown, Md.
Springfield Mach. Tool Co., Springfield, Ohio.
West Steel Casting Co., Cleveland, Ohio.

Cements, Iron
Hilo Varnish Corporation, Brooklyn, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J.

Centering Machines
Cadillac Tool Co., Detroit, Mich.
Hendey Mach. Co., Torrington, Conn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Standard Engineering Wks., Pawtucket, R. I.
Whitcomb Mach. Co., D. E., New London, Conn.

Centers, Planer
Cincinnati Planer Co., Cincinnati, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Woodward & Powell Planer Co., Worcester.

Chains (See Sprockets and Chains)

Chain, Driving
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Link-Belt Co., Philadelphia, Chicago.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

Chasers
Bay State Tap & Die Co., Mansfield, Mass.

Chemists
Souther Engineering Corp., Hy., Hartford, Conn.

Chucking Machines
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Machine Tool Co., Bridgeport, Conn.
Cleveland Auto Mach. Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
McDonough Mfg. Co., Eau Claire, Wis.
New Britain Machine Co., New Britain, Conn.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland.

Chucks, Centering
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Cushman Chuck Co., Hartford, Conn.
Thomas Elevator Co., Chicago, Ill.

Chucks, Drill and Tap
Almond Mfg. Co., T. R. Ashburnham, Mass.
American Machine Co., Hartford, Conn.
American Pneumatic Chuck Co., Chicago, Ill.
Bicknell-Thomas Co., Greenfield, Mass.
Clark Equipment Co., Buchanan, Mich.
Cushman Chuck Co., Hartford, Conn.
Eastern Tube & Tool Co., Brooklyn, N. Y.
Goodell-Pratt Co., Greenfield, Mass.
Hammacher, Schlemmer & Co., N. Y. City.
Horton & Son Co., E., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Jarvis Co., Charles L., Gildersleeve, Conn.
Manufacturers' Equipment Co., Chicago, Ill.
Marvin & Casler Co., Canastota, N. Y.
Modern Tool Co., Erie, Penn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Peter Bros. Mfg. Co., Algonquin, Ill.
Pratt Chuck Co., Frankfort, N. Y.
Scully-Jones Co., 649 Railway Exc., Chicago.
S. & C. Mfg. Co., Penobscot Bldg., Detroit, Mich.
S K F Industries, Inc., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Victor Tool Co., Waynesboro, Penn.
Wahlstrom Tool Co., Brooklyn, N. Y.
Watts Bros. Tool Works, Turtle Creek, Pa.
Whitney Mfg. Co., Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Lathe
Advance Tool Co., Cincinnati, Ohio.
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Pneumatic Chuck Co., Chicago, Ill.
Bullard Machine Tool Co., Bridgeport, Conn.
Cushman Chuck Co., Hartford, Conn.
Dayton Reliance Tool & Mfg. Co., Dayton, Ohio
Frontier Chuck & Tool Co., Buffalo, N. Y.
Gisholt Mach. Co., Madison, Wis.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
Manufacturers' Equipment Co., Chicago, Ill.
Pratt Chuck Co., Frankfort, N. Y.
Simplex Tool Co., Woonsocket, R. I.
Skinner Chuck Co., New Britain, Conn.
Terkelsen & Wennberg, Boston, Mass.
Thomas Elevator Co., Chicago, Ill.
Union Mfg. Co., New Britain, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Chucks, Magnetic
D & W Fuse Co., Providence.
Heald Mach. Co., Worcester, Mass.
Persons-Arter Mach. Co., Worcester, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.
Worcester Machine Works, Worcester, Mass.

Chucks, Planer
American Pneumatic Chuck Co., Chicago, Ill.
Cincinnati Planer Co., Cincinnati, Ohio.
D & W Fuse Co., Providence.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Walker Co., O. S., Worcester, Mass.

Chucks, Split
Ames Co., B. C., Waltham, Mass.
Rivett Lathe & Grinder Co., Brighton, Boston.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.
Wade-American Precision Tool Co., Boston.

Chucks, Vertical Boring Mill
Bullard Machine Tool Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.

Chucks, Wrenchless
Thomas Elevator Co., Chicago, Ill.

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago.
Hammacher, Schlemmer & Co., N. Y. City.
Reed Mfg. Co., Erie, Penn.
Starrett Co., L. S., Athol, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Cleaners, Metal, Waste, General
Oakley Chemical Co., 24 Thames St., N. Y. City.

Clocks, Time
Calculagraph Co., 30 Church St., N. Y. City.
Gisholt Machine Co., Madison, Wis.
International Time Recording Co., N. Y. C.

Clutches, Friction
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Brown Engineering Co., Reading, Penn.
Dodge Sales & Engineering Co., Mishawaka, Ind.
Billiard Clutch & Mchry. Co., Elmira, N. Y.
Johnson Machine Co., Carlyle, Manchester, Conn
Link-Belt Co., Chicago, Philadelphia.
Moore & White Co., Phila., Pa.
Oesterlein Machine Co., Cincinnati, Ohio
Transmission Ball Bearing Co., Buffalo, N. Y.

Coal and Ash Handling Machinery
Link-Belt Co., Chicago, Philadelphia.
Shepard Electric C. & H. Co., Montour Falls, N. Y
Whiting Foundry Equipment Co., Harvey, Ill.

Coal-Storage Systems
Link-Belt Co., Chicago, Philadelphia.

Coils, Electrical
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.

Collars, Shaft or Set
Royersford Fdry. & Mach. Co., Royersford, Pa.

Collars, Spacing
Detroit Stamping Co., 951 W. Fort St., Detroit.
Scully-Jones Co., 649 Railway Exc., Chicago.

Collets
Bay State Tap & Die Co., Mansfield, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Modern Tool Co., Erie, Penn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Standard Engineering Wks., Pawtucket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Hartford, Conn.

Compounds, Carburizing, Casehardening and Tempering
Bennett Co., W. R., Elmwood, Conn.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Rogers & Hubbard Co., Middletown, Conn.
Shore Instrument & Mfg. Co., N. Y. City.
Steel Treating Equipment Co., Detroit, Mich.

Compounds, Cleaning
Oakley Chemical Co., 24 Thames St., N. Y.

Compounds, Cutting, Drawing, Drilling, Grinding and Screw Cutting
Fiske Bros. Refining Co., 24 State St., N. Y. C.
Oakley Chemical Co., 24 Thames St., N. Y.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Compounds, Pipe-Joint
Smooth-On Mfg., Jersey City, N. J.

Compressors, Air and Gas
Black & Decker Mfg. Co., Baltimore, Md.
Chicago Pneumatic Tool Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hartford Machine Screw Co., Hartford, Conn.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Stratton & Bragg Co., Petersburg, Va.
Sullivan Machinery Co., Chicago, Ill.
Taylor Instrument Co.'s, Rochester, N. Y.
Worthington Pump & Mchy. Corp., N. Y. City.

Conduits, Interior
General Electric Co., Schenectady, N. Y.

Cones, Friction
Evans Fric. Cone Co., Newton Highlands, Mass.

Connecting-Rods and Straps
Standard Gauge Steel Co., Beaver Falls, Penn.

Connectors, Solderless
Holtzer-Cabot Electric Co., Boston.

Contract Work
Acklin Stamping Co., 1655 Dorr St., Toledo, O.
American Instrument Works, Pittsburgh, Pa.
American Tool & Mfg. Co., Urbana, Ohio
Atlantic Mfg. Co., Milford, Conn.
Becker Milling Mach. Co., Hyde Park, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bishop Machine Co., 25 Barclay St., N. Y. City.
Blair Tool & Mch. Wks., 521 Greenwich St., N. Y.
Boston Scale & Machine Co., Boston, Mass.
Brady Foundry Co., Jas. A., Chicago.
Brock, Jr., Tool & Mfg. Wks., Arthur, Phila.
Brown & Sharpe Mfg. Co., Providence, R. I.
Budd & Ranney Engineering Co., Columbus, O.
Buffalo Pitts Co., Buffalo, N. Y.
Columbus Die Tool & Mach. Co., Columbus, O
Commercial Engineering Co., Cleveland, Ohio.
Corbin Screw Corp., New Britain, Conn.
Cotton, Inc., H. W., Woolworth Bldg., N. Y. City.
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
Emery, A. H., Glenbrook, Conn.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gem City Machine Co., Dayton, Ohio.
General Machine Wks., York, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Hartford Mach. Screw Co., Hartford, Conn.
Hartford Special Mchy. Co., Hartford, Conn.
Krasberg Engineering & Mfg. Corp., Chicago, Ill.
Lincoln Machine Co., Pawtucket, R. I.
Marf Machine Co., 17 Vandewater St., N. Y. C.
Marvin & Casler Co., Canastota, N. Y.
Mehl Machine Tool & Die Co., Rochelle, N. J.
Modern Tool Die & Mach. Co., Columbus, Ohio.
Moody Tool Wks., Chas. J., Elgin, Ill.
New Britain Machine Co., New Britain, Conn.
Newton Machine Tools Works, Philadelphia, Pa.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Parker Mach. Co., 221 High St., Boston.
Potter Tool & Mach. Wks., 79 E. 130th St., N. Y.
Reynolds Machine Co., Massillon, Ohio
Rogers Machine Tool Co., Salamanca, N. Y.
Root Co., C. J., Bristol, Conn.
Rowbottom Machine Co., Waterbury, Conn.
Scott Engineering Co., Martin, N. Y. City.
Service Engineering Co., 25 Church St., N. Y. C.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Shepherd Engineering Co., Williamsport, Penn.
Slocum, Avram & Slocum Lab., Newark, N. J.
Sloan & Chace Mfg. Co., Newark, N. J.
Steel Products Engineering Co., Springfield, O.
Stratton & Bragg Co., Petersburg, Va.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Machine Co., Cleveland, O.
Terkelsen & Wennberg, Boston, Mass.
Union Mfg. Co., Union Hill, N. J.
Wade-American Precision Tool Co., Boston.
Weber & Scher Mfg. Co., Newark, N. J.
West & Dodge Co., Boston, Mass.
Whatley Co., A. H., Providence, R. I.
Whiting & Comstock, Hartford, Conn.
Zumbach Machine Co., 134 W. 54th St., N. Y. C.

Controllers and Starters, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Converters
General Electric Co., Schenectady, N. Y.

Conveyors and Elevators (See Elevators)

Counterbores
Advance Tool Co., Cincinnati, Ohio.
Hall Mfg. Co., Abington, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
S. & C. Mfg. Co., Penobscot Bldg., Detroit, Mich.
Slocomb Co., J. T., Providence.

Countershafts
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Machine Co., Providence.
Evans Fric. Cone Co., Newton Highlands, Mass.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Norton Co., Worcester, Mass.

Countersinks
Brewster & Co., Wm., 30 Church St., N. Y. City
Clark Equipment Co., Buchanan, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lincoln Twist Drill Co., Taunton, Mass.

Counters, Revolution
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Durant Mfg. Co., Milwaukee, Wis.
Veeder Mfg. Co., Hartford, Conn.

Counting Machines
Brown Instrument Co., Philadelphia, Pa.
Durant Mfg. Co., Milwaukee, Wis.
Veeder Mfg. Co., Hartford, Conn.

Counting and Printing Wheels
Doehler Die Casting Co., Brooklyn, N. Y.
Franklin Mfg. Co., Syracuse, N. Y.

Couplings, Flexible
Karge-Baker Corp., Phoenix, N. Y.
Smith and Serrell, 138 Cedar St., N. Y. City.

Couplings, Rigid
Smith & Serrell, 138 Cedar St., New York City.

Couplings, Shaft
Almond Mfg. Co., T. R., Ashburnham, Mass.
Dexter Co., I. H., 27 Walker St., N. Y. C.
Dodge Sales & Engineering Co., Mishawaka, Ind.
Johnson Machine Co., Carlyle, Manchester, Conn.
Karge-Baker Corp., Phoenix, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Smith and Serrell, 138 Cedar St., N. Y. City.
Standard Gauge Steel Co., Beaver Falls, Penn.

Cranes, Electric
Link-Belt Co., Chicago, Philadelphia.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hand (See Hoists)

Cranes, Locomotive
Link-Belt Co., Chicago, Philadelphia.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

BAY STATE

DURABILITY

The Bay State Tap is the Mammoth of Tool Durability. The steel is of finest quality, carefully hardened. Throughout, the workmanship reflects a thoroughness attained only by experts and by unlimited experience. Combined with this Mammoth Strength, the Bay State Tools evince an equally high plane of Accuracy, Uniformity and Finish.

Send for the story of the mammoth tools. Our 100-Page Catalog also includes the Bay State Dies and Screw Plates.

Bay State Tap & Die Co.
Mansfield, Mass., U. S. A.

Cranes, Traveling
Canton Foundry & Machine Co., Canton, Ohio.
Case Crane & Engineering Co., Columbus, Ohio.
Chesapeake Iron Wks., Baltimore, Md.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Link-Belt Co., Chicago, Philadelphia.
Niles-Bement-Pont Co., 111 Broadway, N. Y. C.
Northern Engineering Wks., Detroit, Mich
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour Falls, N. Y
Toledo Bridge & Crane Co., Toledo, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Crank Pin Turning Machines
Niles-Bement-Pond Co., 111 Broadway, N. Y C.
Underwood Corp., H. B., Philadelphia, Penn.

Cupolas and Ladles
Paxson Co., J. W., Philadelphia, Penn.
Whiting Foundry Equipment Co., Harvey, Ill.

Cutters, Flue
Clark Equipment Co., Buchanan, Mich.

Cutters, Gear
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I
Cleveland Milling Machine Co., Cleveland, Ohio.
Goddard Tool Co., Chicago, Ill.
National Twist Drill & Tool Co., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.

Cutters, Milling
Advance Tool Co., Cincinnati, Ohio.
American Machine Products Co., Detroit.
Barber-Colman Co., Rockford, Ill.
Becker Milling Machine Co., Hyde Park, Mass.
Bilton Machine Tool Co., Bridgeport, Conn.
Brewster & Co., Wm., 30 Church St., N. Y. City
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Milling Machine Co., Cleveland, Ohio.
Cowles Tool Co., Cleveland, Ohio.
Detroit Reamer & Tool Co., Detroit, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Goddard & Goddard, Detroit, Mich.
Goddard Tool Co., Chicago, Ill.
Hall Mfg. Co., Abington, Mass.
Hanscom Cutter Works, Hyde Park, Boston.
Ingersoll Milling Mach. Co., Rockford, Ill.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Lincoln Twist Drill Co., The, Taunton, Mass
Moody Tool Wks., Chas. J., Elgin, Ill.
National Tool Co., Cleveland, Ohio.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., N. Y. City.
Thurston Mfg. Co., Providence, R. I.
Tool Salvage Co., Detroit, Mich.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

Cutters, Stay Bolt
Baird Pneumatic Tool Co., Kansas City, Mo.

Cutters, Thread
Rivett Lathe & Grinder Co., Brighton, Boston.
Universal Machine Co., Bowling Green, Ohio.

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Automatic Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Cochrane-Bly Co., Rochester, N. Y.
Curtis & Curtis Co., Bridgeport, Conn.
Davis Machine Tool Co., Rochester, N. Y.
Earle Gear & Machine Co., Philadelphia, Penn.
Etna Machine Co., Toledo, Ohio
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gorton Mach. Co., Geo., Racine, Wis.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Hurlbut-Rogers Mchy. Co., South Sudbury, Mass.
Newton Mach. Tool Works, Philadelphia, Penn.
Peter Bros. Mfg. Co., Algonquin, Ill.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Parker Machine Co., 221 High St., Boston
Pratt & Whitney Co., Hartford, Conn.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

Cutting Oil Filters (See Oil Filtering Systems)

Cutting, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N. J.
Milburn Co., Alexander, Baltimore, Md.
Oxweld Acetylene Co., Chicago, Ill.

Cut-Outs, Electrical
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Dealers, Machinery (See Searchlight Section)
American Can Co., New York City
American Machinery Exchange, N. Y. City.
Badger-Packard Machinery Co., Milwaukee.
Barbour, Love & Woodward, N. Y. City.
Bosworth, W. H., Cleveland, Ohio
Broadway Machinery Co., Cincinnati, Ohio.
Brownell Machry. Co., Providence, R. I.
Calumet Iron & Metal Co., Chicago, Ill.
Carter Machinery Sales Co., Buffalo, N. Y.
Dale-Brewster Machinery Co., Chicago, Ill.
Duff Co., J. E., 247 Center St., N. Y. C.
Fairbanks Co., New York City
Fales Machinery Co., C. E., Detroit.
Ford Motor Co., Highland Park, Mich.
Freidus Bros., 253 Centre St., N. Y. City.
Garvin Machine Co., Spring & Varick St., N.Y.C.
Gelb & Co., J., 201 Center St., N. Y. C.
Graves Mchy. Exchange, 50 Church St., N. Y. C.
Greaves-Klusman Tool Co., Cincinnati.
Hannan-Finton Co., Springfield, Mass.
Hermance Machine Co., Williamsport, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Hyde Park Mfg. Co., Hyde Park, Mass.
Industrial Machy. Corp., Jersey City, N. J.
Kaeser Co., New Haven, Conn.
Kinsey Co., E. A., Cincinnati, Ohio.
Lamberg & Co., A., New York City.
Lynd-Farquhar Co., 419 Atlantic Ave., Boston.
McDonough Mfg. Co., Eau Claire, Wis.
McMullen Mchy. Co., Grand Rapids, Mich.
Marshall & Huschart Mchry. Co., Chicago, Ill.
Modern Machinery Exchange, N. Y. City.
Morey & Co., 50 Church St., N. Y. City.
Morris Machinery Co., Newark, N. J.
Morton Machy. Co., 139 N. 3 St., Phila.
Motch & Merryweather Mchy. Co., Cleveland.
New Jersey Machinery Exchange, Newark, N. J.
Niles-Bement-Pond Co., 115 Bway., N. Y. C.
Noble Machinery Co., New York City
Pattison Supply Co., W. M., Cleveland, Ohio.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Prichard Co., C. W., New York City
Richmond Forgings Co., Richmond, Va.
Romain Machy. Co., W. L., Milwaukee.
Russian-Remington R. C. Trustees, N. Y. City
Ryerson Co., Joseph, Chicago, Ill.
Saxer Machinery Co., Erie, Pa.
Schoonmaker & Sons, A. G., New York City.
Simmons Mach. Co., 149 Broadway, N. Y. City.
Stickley Mach. Co., E. B., Goebel Bldg., Detroit.
Toomey, Frank, 127 N. 3rd St., Phila., Penn.
Vandyck, Churchill Co., 93 Liberty St., N. Y. C.
Vonnegut Machinery Co., Indianapolis, Ind.
Walsh Machinery Co., M. J., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh.
Winterer, Herman L., Philadelphia, Pa.
Young, Corley & Dolan, 28 W. Broadway, N. Y. C.
Zelnicker Supply Co., W. A., St. Louis, Mo.

Diamond Tools
Crafts & Co., Arthur A., 125 Summer St., Boston.
Desmond-Stephen Mfg. Co., Urbana, Ohio
Dickinson, Thomas L., 64 Nassau St., N. Y. City
Francis & Co., 50 State St., Hartford, Conn.
Wheel Trueing Tool Co., 320 Ford Bldg., Detroit.

Die Making Machines
Anderson Die Mach. Co., Bridgeport, Conn.
Boston Tool & Mfg. Co., Boston, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Keller Mech. Engraving Co., Brooklyn, N. Y.
Thurston Mfg. Co., Providence, R. I.

Die Sinking Machines, Automatic
Keller Mech. Engraving Co., Brooklyn, N. Y.

Dies, Forging
Keller Mech. Engraving Co., Brooklyn, N. Y.

Dies, Sheet Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
Eastern Mach. Screw Corp., New Haven, Conn
Errington, F. A., 41 Cortlandt St., N. Y. City.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Jones & Lamson Mach Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Mch. & Tool Co., 64 Porter St., Detroit
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland, Ohio.

Dividing Heads
Whiting & Comstock, Hartford, Conn.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.
Union Tool Co., Orange, Mass.
West Steel Casting Co., Cleveland, Ohio.
William & Co., J. H., 35 Richards St., Brooklyn.

Drafting Boards and Tables
Spaulding-Moss Co., Boston, Mass.

Drafting Materials
Spaulding-Moss Co., Boston, Mass.

Dressers, Grinding Wheel
Bay State Stamping Co., Worcester, Mass.
Crafts & Co., Arthur A., 125 Summer St., Boston
Desmond-Stephan Mfg. Co., Urbana, Ohio.
Francis & Co., 50 State St., Hartford, Conn.
Norton Co., Worcester, Mass.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Union Tool Co., Orange, Mass.

Drill Rods
Boker & Co., H., 101 Duane St., N. Y. City.

Drill Speeders
Graham Mfg. Co., Providence, R. I.
Turner Machine Co., Danbury, Conn.

Drilling Machine Heads
Baush Machine Tool Co., Springfield, Mass.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Nelson-Blanck Mfg. Co., Detroit, Mich.
Sellew Machine Tool Co., Pawtucket, R. I.
Spafford Tool Works, Hartford, Conn.

Drilling Machines, Automatic
Baker Bros., Toledo, Ohio.
Baush Machine Tool Co., Springfield, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machinery Co., Cincinnati, O.
Langelier Mfg. Co., Arlington, Cranston, R. I.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Mchy. Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Goodell-Pratt Co., Greenfield, Mass.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Pratt & Whitney Co., Hartford, Conn.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Standard Electric Tool Co., Cincinnati, O.
Taylor & Fenn Co., Hartford, Conn.
U. S. Electrical Tool Co., Cincinnati, Ohio.

Drilling Machines, Electric and Hand
Black & Decker Mfg. Co., Baltimore, Md.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Neil & Smith Electric Tool Co., Cincinnati, Ohio
Silver Mfg. Co., Salem, Ohio.
Standard Electric Tool Co., Cincinnati, O.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Baker Bros., Toledo, Ohio.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Pa.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Moline Tool Co., Moline, Ill.
Silver Mfg. Co., Salem, Ohio.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J.
Taylor & Fenn Co., Hartford, Conn.

Drilling Machines, Heavy Duty
Baker Bros., Toledo, Ohio.
Betts Mach. Co., Rochester, N. Y.
Colburn Mach. Tool Co., Franklin, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Minster Machine Co., Minster, Ohio.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baush Machine Tool Co., Springfield, Mass.
Fox Mach. Co., Jackson, Mich.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Langelier Mfg. Co., Arlington, Cranston, R. I.
National Automatic Tool Co., Richmond, Ind.
Newton Mach. Tool Works, Philadelphia, Penn.
Sellers & Co., Wm., Philadelphia, Pa.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, Ohio
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.

Drilling Machines, Portable
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Independent Pneumatic Tool Co., Chicago, Ill.
Newton Mach. Tool Works, Philadelphia, Pa.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Van Dorn Electric Tool Co., Cleveland, Ohio.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
American Tool Works Co., Cincinnati, Ohio.
Baush Machine Tool Co., Springfield, Mass.
Betts Machine Co., Rochester, N. Y.
Carlton Mach. Tool Co., Cincinnati, Ohio.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Dauber-Kratsch Co., Oshkosh, Wis.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Fosdick Mach. Tool Co., Cincinnati, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Lynd-Farquhar Co., Boston, Mass.
Morris Mach. Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Newton Mach. Tool Wks., Philadelphia, Pa.
Niles-Bement-Pond Co., 11 Broadway, N. Y. City
Reed-Prentice Co., Worcester, Mass.
Sellers & Co., Wm., Philadelphia, Pa.

Drilling Machines, Sensitive
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Edlund Machry. Co., Inc., Cortland, N. Y.
Henry & Wright Mfg. Co., Hartford, Conn.
Knight Machy. Co., W. B., St. Louis, Mo.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Reed-Prentice Co., Worcester, Mass.
Royersford Fdry. & Mach. Co., Royersford, Penn.
Sigourney Tool Co., Hartford, Conn.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J.
Taylor & Fenn Co., Hartford, Conn.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
National Automatic Tool Co., Richmond, Ind.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Vertical
Baker Bros., Toledo, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Inc., Rockford, Ill.
Baush Machine Tool Co., Springfield, Mass.
Betts Machine Co., Rochester, N. Y.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Colburn Mach. Tool Co., Franklin, Pa.
Davis Machine Tool Co., Rochester, N. Y.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Knight Machy. Co., W. B., St. Louis, Mo.
Langelier Mfg. Co., Arlington-Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Niles-Bement-Pond Co., 111 Bway, N. Y. City
Reed-Prentice Co., Worcester, Mass.
Rockford Lathe & Drill Co., Rockford, Ill.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Taylor & Fenn Co., Hartford, Conn.
Turner Machine Co., Danbury, Conn.

Drills, Center
Lincoln Twist Drill Co., Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Slocomb Co., J. T., Providence, R. I.
Union Twist Drill Co., Athol, Mass.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Goodell-Pratt Co., Greenfield, Mass.
Lincoln Twist Drill Co., Taunton, Mass.
National Twist Drill & Tool Co., Detroit, Mich.

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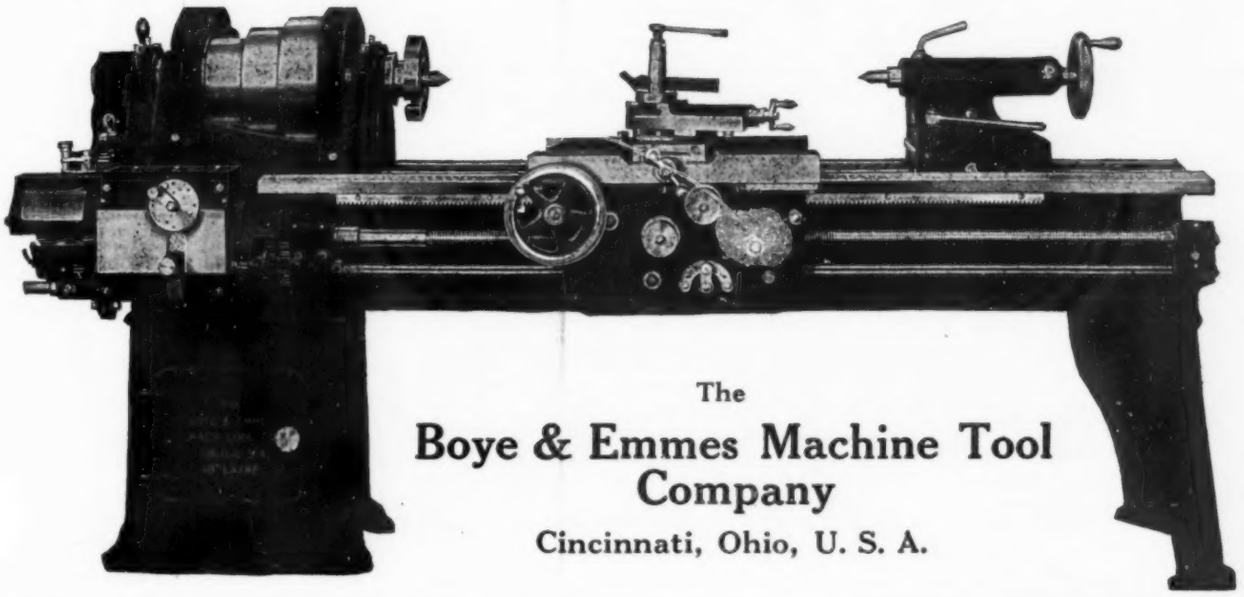
This is the 18-in. Instantaneous Change Gear Engine Lathe—Double Back Geared—Double Plate Apron



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If you want
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New Bedford, Mass., U. S. A.

Reliance Steel & Tool Co., 24 Murray St., N. Y.
Union Twist Drill Co., Althol, Mass.

Drills, Square and Hexagon
Watts Bros. Tool Works, Turtle Creek, Pa.

Drills, Twist and Flat
American Machine Products Co., Detroit.
American Twist Drill Co., Detroit, Mich.
Buckeye Twist Drill Co., Alliance, Ohio.
Clark Equipment Co., Buchanan, Mich.
Colton Co., Arthur, Detroit, Mich.
Hammacher, Schlemmer & Co., N. Y. City.
Latrobe Tool Co., Latrobe, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit, Mich.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

Dust Handling Equipment
Pangborn Corporation, Hagerstown, Md.

Dynamometers
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.

Electrical Instruments
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Electrical Supplies
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Johns-Manville Co., H. W., N. Y. City.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Elevating Trucks (See Trucks)

Elevators and Conveyors
Albro-Clem Elevator Co., Philadelphia, Pa.
Caldwell & Son Co., Chicago, Ill.
Link-Belt Co., Chicago, Philadelphia.
Pangborn Corporation, Hagerstown, Md.

Emery Wheels (See Grinding Wheels)

Enamels, Machinery
Hilo Varnish Corp., 8 Gerry St., Bklyn., N. Y.

Engineers, Mechanical
Fifer, Jesse R., 298 Broadway, N. Y. City
Hartford Special Machy. Co., Hartford, Conn.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Service Engineering Co., N. Y. City.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Engraving Machinery
Engravers & Printers Mch. Co., Sag Harbor, N. Y.
Gorton Mach. Co., Geo., Racine, Wis.
Keller Mech. Engraving Co., Brooklyn, N. Y.

Expanders, Tube
Watson-Stillman Co., 42 Church St., N. Y. City.

Eyeglass, Safety (See Goggles, Safety)

Eye Protectors
Willson & Co., T. A., Reading, Pa.

Fans, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

Fans, Exhaust
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Fans, Ventilating
General Electric Co., Schenectady, N. Y.
Mechanical Appliance Co., Milwaukee, Wis.

File Handles
Grover File Co., Nashua, N. H.
Nicholson File Co., Providence, R. I.

Files and Rasps
American Swiss File & Tool Co., N. Y. C.
Barnett Co., G. & H., Philadelphia, Pa.
Delta File Works, Philadelphia, Pa.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Nicholson File Co., Providence, R. I.
Simonds Mfg. Co., Fitchburg, Mass.
Vixen Tool Co., Newark, N. J.

Filing Machines
Ames Co., B. C., Waltham, Mass.
Anderson Die Mach. Co., Bridgeport, Conn.
Boston Tool & Mfg. Co., Boston, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Colton Co., Arthur, Detroit, Mich.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Thurston Mfg. Co., Providence, R. I.

Filler, Iron (See Cement, Iron)

Fittings, Hydraulic
Elmes Engineering Works, Chas. F., Chicago, Ill.
Watson-Stillman Co., 42 Church St., N. Y. City.

Flexible Shafts
Chicago Flexible Shaft Co., Chicago, Ill.
Errington, F. A., 41 Cortland St., N. Y. City.
Gem Mfg. Co., Pittsburgh, Pa.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bradley & Son, C. C., Syracuse, N. Y.
National Machinery Co., Tiffin, Ohio.

Forgings, Drop
Bearings Co. of America, Lancaster, Pa.
Johnston & Jennings Co., Cleveland, Ohio.
Moore Drop Forging Co., Springfield, Mass.
Universal Machine Co., Bowling Green, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn

Forgings, Hammer
Aborn Steel Co., Inc., 22 Clarke St., N. Y. City.
Halcomb Steel Co., Syracuse, N. Y. City.
Hobson, Houghton & Co., New York City.
Johnston & Jennings Co., Cleveland, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn

Foundry Equipment
Anderson Bros. Mfg. Co., Rockford, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Supplies
Paxson Co., J. W., Philadelphia, Pa.

Furnaces, Heat-Treating, Coal
American Incandescent Heat Co., Boston.

Furnaces, Heat-Treating Oil and Gas
American Gas Furnace Co., 24 John St., N. Y. C.
American Incandescent Heat Co., Boston, Mass.
Baird Pneumatic Tool Co., Kansas City, Mo.
Bennett Co., W. R., Elmwood, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

Furnaces and Ovens, Electric
Brown Instrument Co., Philadelphia, Pa.
Englehard, Charles, 30 Church St., N. Y. City.
General Electric Co., Schenectady, N. Y.

Furnaces, Tempering and Annealing
Bennett Co., W. R., Elmwood, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker, Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa

Furniture, Machine Shop
Brown Engineering Co., Reading, Pa.
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framington, Mass.
New Britain Mach. Co., New Britain, Conn.

Fuses, Electric
Johns-Manville Co., H. W., N. Y. City.

Gages, Amplifying
American Gauge Co., Dayton, Ohio

Gages, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Starrett Co., L. S., Athol, Mass.

Gages, Recording
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence, R. I.
Greenfield Tap and Die Corp., Greenfield, Mass.
Johansson, Inc., C. E., Poughkeepsie, N. Y.
Lowry-Knise Tool Co., Syracuse, N. Y.
West & Dodge Co., Boston, Mass.

Gages, Special Measuring (See Tool Work)

Gages, Standard
Advance Tool Co., Cincinnati, Ohio.
Bicknell-Thomas Co., Greenfield, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Johansson, Inc., C. E., Poughkeepsie, N. Y.
West & Dodge Co., Boston, Mass.

Gages, Thread
Arrow Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cotton, Inc., H. W., Woolworth Bldg., N.Y.City.
Greenfield Tap & Die Corp., Greenfield, Mass.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
West & Dodge Co., Boston, Mass.

Galvanizing Outfits, Electro
Cutter & Wood Supply Co., Boston, Mass.

Gas, Compressed
Davis-Bournonville Co., Jersey City, N. J.
Oxweld Acetylene Co., Chicago, Ill.

Gaskets
Graton & Knight Mfg. Co., Worcester, Mass.

Gear Blanks
Hartford Machine Screw So., Hartford, Conn.
Joanston & Jennings Co., Cleveland, Ohio.

Gear Cutting Machines
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Becker Milling Mach. Co., Hyde Park, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Gear Cutting Mach. Co., Cincinnati.
Clough, R. M., Meriden, Conn.
Fellows Gear Shaper Co., Springfield, Vt.
Fiather Mfg. Co., Nashua, N. H.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt, Rochester, N. Y.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Machine Products Co., Cleveland, Ohio.
Newark Gear Cutting Mach. Co., Newark, N. J.
Newton Mach. Tool Works, Philadelphia, Pa.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sloan & Chace Mfg. Co., Newark, N. J.
Van Dorn & Dutton Co., Cleveland, Ohio.
Waltham Mach. Works, Waltham, Mass.
Whiting & Comstock, Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.

Gear Tempering Machinery
Gleason Works, Rochester, N. Y.

Gear Testing Machinery
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., Madison, Wis.
Gleason Works, Rochester, N. Y.
Machine Products Co., Cleveland, Ohio.

Gears, Cast
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Caldwell & Son Co., H. W., Chicago, Ill.
Carpenter Tew Gear Co., Brooklyn, N. Y.
Cleveland Worm Gear Co., Cleveland, Ohio.
Franklin Mfg. Co., Syracuse, N. Y.
Grant Gear Works, 151 Pearl St., Boston, Mass
Horsburgh & Scott Co., Cleveland, Ohio.
Jones Fdry. & Mach. Co., W. A., Chicago.
Link-Belt Co., Chicago, Philadelphia.
Philadelphia Gear Works, Philadelphia, Pa.
Van Dorn & Dutton Co., Cleveland, Ohio.

Gears, Cut
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Albaugh-Dover Co., Chicago, Ill.
Albro-Clem Elevator Co., Philadelphia, Pa.
Baush Machine Tool Co., Springfield, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Carpenter Tew Gear Co., Brooklyn, N. Y.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Cincinnati Gear Co., Cincinnati, Ohio.
Cleveland Worm Gear Co., Cleveland, Ohio.
Crofoot Gear Wks., Sta. "A," Cambridge, Mass.
Fawcus Machine Co., Pittsburgh, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Mfg. Co., Nashua, N. H.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow Co., Wm., Chicago, Ill.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
General Electric Co., Schenectady, N. Y.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt., Newark, N. J.
Grant Gear Works, Inc., 151 Pearl St. Boston.
Horsburgh & Scott Co., Cleveland, Ohio.
Jones Fdry. & Mach. Co., W. A., Chicago.
Lees-Bradner Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Philadelphia.
Machine Products Co., Cleveland, Ohio.
M-C Mfg. Co., 28 Congress St., Newark, N. J.
Meacham Gear Corp., Syracuse, N. Y.
Newark Gear Cutting Mach. Co., Newark, N. J.
New Britain Mach. Co., New Britain, Conn.
Philadelphia Gear Works, Philadelphia, Pa.
Simonds Mfg. Co., Pittsburgh, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Mach. Co., Cleveland, O.
Van Dorn & Dutton Co., Cleveland, Ohio.

Gears, Herringbone
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Carpenter Tew Gear Co., Brooklyn, N. Y.
Fawcus Machine Co., Pittsburgh, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Machine Products Co., Cleveland, Ohio.

Gears, Rawhide (See Gears, Cut)

Gears, Worm
Cleveland Worm Gear Co., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Philadelphia Gear Works, Philadelphia, Pa.

Generators, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Reliance Electric & Engineering Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

Goggles, Safety
Willson & Co., T. A., Reading, Penn.

Grab Buckets
Link-Belt Co., Chicago, Philadelphia.

Greases, Lubricating
Fiske Bros. Refining Co., 24 State St., N. Y. City.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Grinding Machines, Abrasive Belt
Blevney Machine Co., Greenfield, Mass.

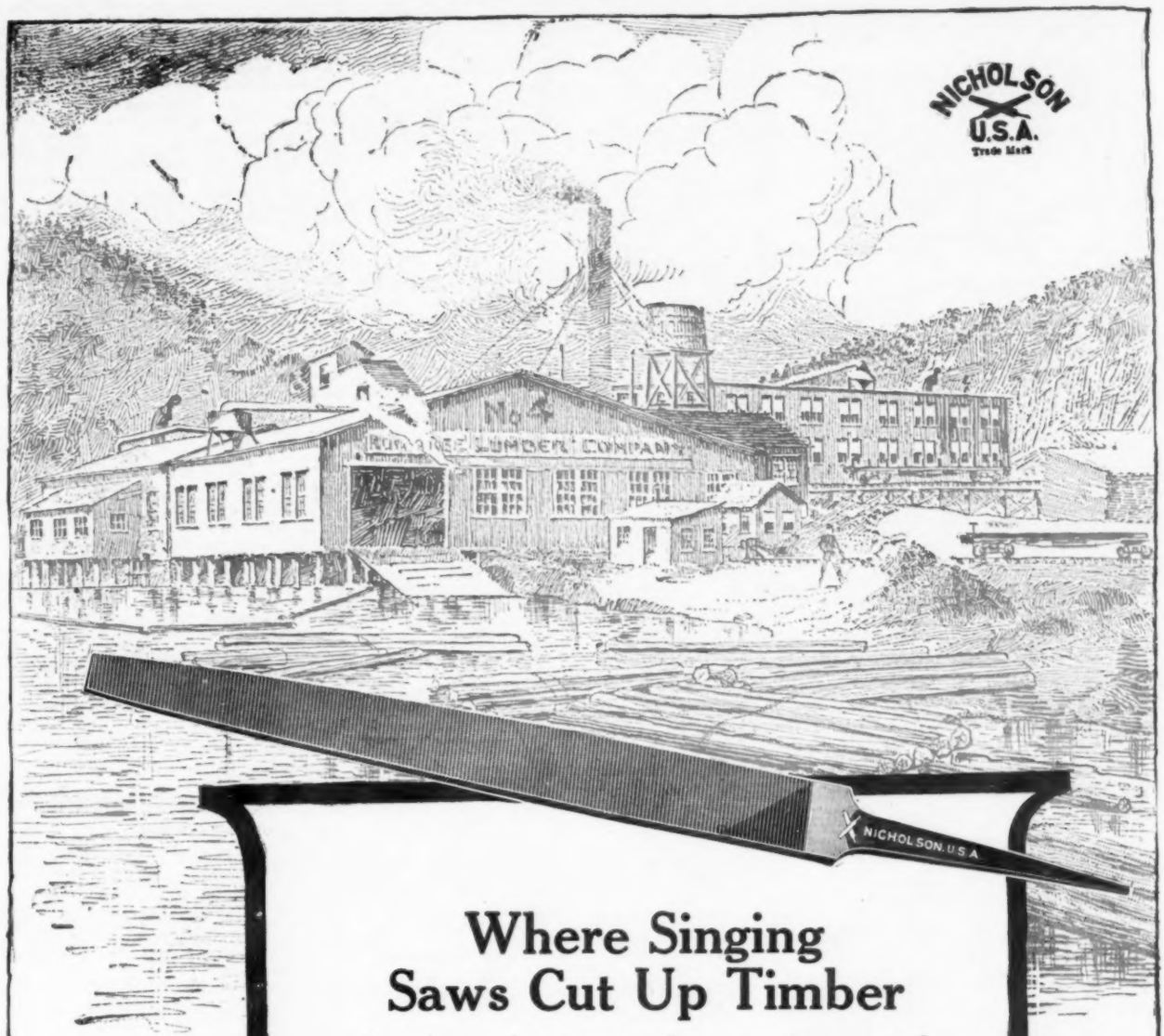
Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Bench
Athol Machine Co., Athol, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Diamond Machine Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Goodell-Pratt Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Lafayette Tool & Equip. Co., Philadelphia.
Marschke Mfg. Co., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Norton Co., Worcester, Mass.
Ransom Mfg. Co., Oshkosh, Wis.
Safety Emery Wheel Co., Springfield, Ohio.
Standard Electric Tool Co., Cincinnati.
Union Twist Drill Co., Athol, Mass.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Center
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Standard Electric Tool Co., Cincinnati.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machines, Chucking
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.
Worcester Machine Works, Worcester, Mass.

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago, Ill.
Barnes, Wm. O., Leominster, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Diamond Machine Co., Providence, R. I.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gisholt Mach. Co., Madison, Wis.
Gould & Eberhardt, Newark, N. J.
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Ingersoll Milling Machine Co., Rockford, Ill.



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Oakley Mach. Tool Co., Cincinnati, Ohio
Oesterlein Mach. Co., Cincinnati, Ohio.
Ott Grinder Co., Indianapolis, Ind.
Pratt & Whitney Co., Hartford, Conn.
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Sellers & Co., Wm., Philadelphia, Pa.
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U. S. Electrical Tool Co., Cincinnati, Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass.
Walker Co., O. S., Worcester, Mass.
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Woods Engineering Co., Alliance, Ohio.

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence, R. I.
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Abrasive Mach. Tool Co., East Providence, R. I.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Blake & Johnson Co., Waterbury Conn.
Blanchard Mach. Co., Cambridge, Conn.
Diamond Machine Co., Providence, R. I.
Fraser Co., Warren F., Westboro, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Heald Mach. Co., Worcester, Mass.
Lafayette Tool & Equip. Co., Philadelphia
Murchey Mach. & Tool Co., Detroit, Mich.
National Machinery Co., Tiffin, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Wilmarth & Morman Co., Grand Rapids, Mich.

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Armstrong Bros. Tool Co., Chicago, Ill.
Badger Tool Co., Beloit, Wis.
Besly & Co., Charles H., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Gardner Machine Co., Beloit, Wis.
Murray-Mylea Mach. Co., Antigo, Wis.
Rowbottom Machine Co., Waterbury, Conn.

Grinding Machines, Drill
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
La Salle Tool Co., La Salle, Ill.
Safety Emery Wheel Co., Springfield, Ohio.
Sellers & Co., Wm., Philadelphia, Pa.
Sterling Grinding Wheel Co., Tiffin, Ohio.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machines, Face
Blanchard Machine Co., Cambridge, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Detroit Tool Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Persons-Arter Mach. Co., Worcester, Mass.

Grinding Machines, Floor and Tool
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Tool Co., Detroit, Mich.
Diamond Mach. Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
La Salle Tool Co., La Salle, Ill.
Marschke Mfg. Co., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Ransom Mfg. Co., Oshkosh, Wis.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Safety Emery Wheel Co., Springfield, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machines, Gage
Abrasive Mach. Tool Co., East Providence, R. I.
Fraser Co., Warren F., Westboro, Mass.
Lafayette Tool & Equip. Co., Philadelphia.
Landis Tool Co., Waynesboro, Pa.
Ott Grinder Co., Indianapolis, Ind.
Rivett Lathe & Grinder Co., Brighton, Boston.

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Bryant Chucking Grinder Co., Springfield, Vt
Fraser Co., Warren F., Westboro, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Lafayette Tool & Equip. Co., Philadelphia.
Landis Tool Co., Waynesboro, Pa.
Ott Grinder Co., Indianapolis, Ind.
Pratt & Whitney, Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Universal Grinding Mach. Co., Fitchburg, Mass
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.
Whitney & Son, Baxter D., Winchendon, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Worcester Machine Works, Worcester, Mass.

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Chicago Pneumatic Tool Co., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Lafayette Tool & Equip. Co., Philadelphia.
Neil & Smith Electric Tool Co., Cincinnati, Ohio.
U. S. Electric Tool Co., Cincinnati, Ohio.
Van Dorn Electric Tool Co., Cleveland, Ohio.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Radial
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Ring Wheel
Besly & Co., Charles H., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Gardner Machine Co., Beloit, Wis.

Grinding Machines, Snagging
Blount Co., J. G., Woodland St., Everett, Mass.
Diamond Machine Co., Providence, R. I.
Ransom Mfg. Co., Oshkosh, Wis.
Walker Co., O. S., Worcester, Mass.

Grinding Machines, Surface
Abrasive Mach. Tool Co., East Providence, R. I.
Blake & Johnson Co., Waterbury, Conn.
Blanchard Machine Co., Cambridge, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Tool Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Fraser Co., Warren F., Westboro, Mass.
Heald Machine Co., Worcester, Mass.
La Salle Tool Co., La Salle, Ill.
Newton Mach. Tool Works, Philadelphia, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Persons-Arter Mach. Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rowbottom Machine Co., Waterbury, Conn.
Safety Emery Wheel Co., Springfield, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass
Walker Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.

Grinding Machine, Thread
Lafayette Tool & Equip. Co., Philadelphia.

Grinding Machines, Tool Post
Gale-Sawyer Co., 33 Wormwood St., Boston.

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinder Co., Cincinnati, Ohio.
Fraser Co., Warren F., Westboro, Mass.
Grand Rapids (Mich.) Grinding Mch. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Lafayette Tool & Equip. Co., Philadelphia.
Landis Tool Co., Waynesboro, Pa.
McDonough Mfg. Co., Eau Claire, Wis.
Ott Grinder Co., Indianapolis, Ind.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg Mass.
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Woods Engineering Co., Alliance, Ohio.

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Cortland Grind. Wheel Co., Cortland, N. Y.
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Dickinson, Thomas L., 64 Nassau St., N. Y. City.
Hampden Corundum Wheel Co., Springfield, Mass.
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Norton Co., Worcester, Mass.
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Sterling Grinding Wheel Co., Tiffin, Ohio.
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Gun Barrel Machinery
Baush Machine Tool Co., Springfield, Mass.
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Sloan & Chace Mfg. Co., Newark, N. J.

Hammering Machines
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Hammers, Drop
Bradley & Son, C. C. Syracuse, N. Y.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

Hammers, Electric
Nazel Engineering & Mach. Works, Philadelphia.

Hammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.

Hammers, Power
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y
Bradley & Son, C. C., Syracuse, N. Y.
Erie Foundry Co., Erie, Pa.
Nazel Engineering & Mach. Works, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
West Tire Setter Co., Rochester, N. Y.

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago, Ill.
Bond Foundry & Machine Co., Manheim, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gurney Ball Bearing Co., Jamestown, N. Y.
Hyatt Roller Bearing Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Ct.
Royersford Foundry & Mach. Co., Royersford, Pa
S K F Industries, Inc., Hartford, Conn.

Hardening, Case-Hardening and Tempering
Bennett Co., W. R., Elmwood, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
Garwood Bronze & Iron Works, Garwood, N. J.
General Machine Works, York, Pa.
Hartford Machine Screw Co., Hartford, Conn.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y. City.

Hobbing Machines
Adams Co., 1901 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Gould & Eberhardt, Newark, N. J.
Lees-Bradner Co., Cleveland, Ohio.
M-C Mfg. Co., 28 Congress St., Newark, N. J.

Hobs
Barber-Colman Co., Rockford, Ill.
Boston Gear Works, Norfolk Downs, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Goddard Tool Co., Chicago, Ill.
Gould & Eberhardt, Newark, N. J.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lees-Bradner Co., Cleveland, Ohio.
National Tool Co., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.

Hoists, Electric
Crocker-Wheeler Co., Ampere, N. J.
Link-Belt Co., Chicago, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, Ohio.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Hoists, Hand
Canton Foundry & Machine Co., Canton, Ohio.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Harrington, Son & Co., Edwin, Phila., Penn.
Reading Chain Block Co., Reading, Penn.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

Hoists, Pneumatic
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Whiting Foundry Equipment Co., Harvey, Ill
Worthington Pump & Mch. Corp., N. Y. City.

Holders-On, Pneumatic
Independent Pneumatic Tool Co., Chicago, Ill.

Hydraulic Leather
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Hydraulic Machinery
Worthington Pump & Mch. Corp., N. Y. City.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn, N. Y.
Holtzer-Cabot Electric Co., Boston

Indicators, Speed and Test
Boston Tool & Mfg. Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Marvin & Casler Co., Canastota, N. Y.
Norton Co., Worcester, Mass.
Starrett Co., L. S., Athol, Mass.
Veeder Mfg. Co., 15 Sargeant St., Hartford, Conn.
Waterston, J. M., 77 Woodward Ave., Detroit.

Inspectors
Souther Engineering Corp., Ry., Hartford, Conn.

Jacks, Hydraulic
Watson-Stillman Co., 42 Church St., N. Y. C.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.

Japans
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

Jigs and Fixtures (See Tool Work)

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence, R. I.
Gray & Prior Mach. Co., Hartford, Conn.
Manufacturing Equipment & Engineering Co., Framingham, Mass.

Keyseating Machines
Baker Bros., Toledo, Ohio.
Davis Machine Tool Co., Rochester, N. Y.
Davis Machine Co., C. F., Rochester, N. Y.
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
Morton Mfg. Co., Muskegon Heights, Mich.
National Machine Tool Co., Cincinnati, Ohio
Newton Machine Tool Wks., Philadelphia, Penn
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Keys, Machine
Moltrup Steel Products Co., Beaver Falls, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Standard Gauge Steel Co., Beaver Falls, Pa.
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Knives, Machine
Simonds Mfg. Co., Fitchburg, Mass.

Knurl Holders
Graham Mfg. Co., Providence, R. I.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Lacing Leather
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Ladders, Permanent
New Britain Machine Co., New Britain, Conn.

Lamps, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

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Ames Co., B. C., Waltham, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Hendey Mach. Co., Torrington, Ct.
Manufacturers Hardware Corp., Milwaukee, Wis.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.
William & Co., J. H., 35 Richards St., Brooklyn.

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Lyon Metallic Mfg. Co., Aurora, Ill.
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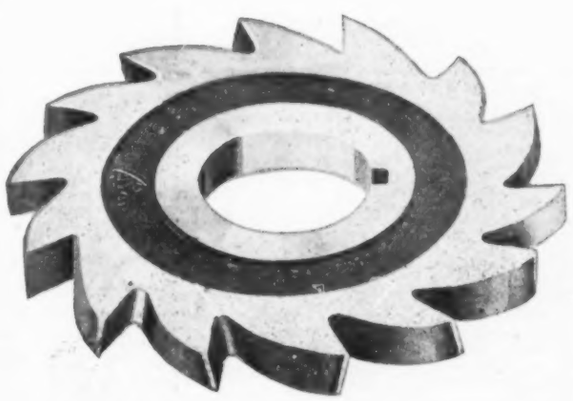

Goddard & Goddard Company
Detroit

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Mach. Co., Madison, Wis.
Lovejoy Tool Co., Springfield, Vt.
Parker Mach. Co., 221 High St., Boston.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Lathes, Automatic and Semi-Automatic
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Reed-Prentice Co., Worcester, Mass.
Steinle Turret Mach. Co., Madison, Wis.
Wood Turret Mach. Co., Brazil, Ind.

Lathes, Bench
Ames Co., B. C., Waltham, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Diamond Mach. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
South Bend Lathe Works, South Bend, Ind.
Stark Tool Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Wade-American Precision Tool Co., Boston.

Lathes, Boring
Gisholt Mach. Co., Madison, Wis.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.

Lathes, Chucking (See Lathes, Horizontal Turret)

Lathes, Engine
Adams Mfg. Co., O. R., Rochester, N. Y.
American Tool Wks. Co., Cincinnati, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Blount Co., J. G., Woodland St., Everett, Mass.
Boye & Emmes Mach. Tool Co., Cincinnati, O.
Bradford Machine Tool Co., Cincinnati, Ohio.
Bullard Machine Tool Co., Bridgeport, Conn.
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Champion Tool Works Co., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., Cincinnati, Ohio.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Davis Mach. Tool Co., Rochester, N. Y.
Fitchburg Machine Works, Fitchburg, Mass.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Mach Co., Madison, Wis.
Greaves, Klusman Tool Co., Cincinnati, Ohio.
Greaves Machine Tool Co., Cincinnati.
Hamilton Machine Tool Co., Hamilton, Ohio.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Lehmann Machine Co., St. Louis, Mo.
Lodge & Shipley Machine Tool Co., Cincinnati,.
Monarch Machine Tool Co., Sidney, Ohio.
Morris Machine Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Reed-Prentice Co., Worcester, Mass.
Rockford Lathe & Drill Co., Rockford, Ill.
Rockford Tool Co., Rockford, Ill.
Sebastian Lathe Co., 117 Culvert St., Cincinnati
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.
Sidney Machine Tool Co., Sidney, Ohio
Springfield Mach. Tool Co., Springfield, Ohio.
Union Lathe Works, York, Pa.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.
Wickes Bros., Saginaw, Mich.
Willard Machine Tool Co., Cincinnati.
Worcester Lathe Co., Worcester, Mass.

Lathes, Extension and Gap
American Tool Wks., Co., Cincinnati, Ohio.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford, Ill.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.

Lathes, Heavy Duty Projectile Boring
Axelson Machine Co., Los Angeles, Calif.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Taylor Mach. Co., Cleveland, O.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison, Wis.
International Mach. Tool Co., Indianapolis, Ind.
Jones & Lamson Mach. Co., Springfield, Vt.
McCabe, J. J., Lathe & Machy. Corp., N. Y. C.
Milholland Mach. Co., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Steinle Turret Mach. Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.
Wood Turret Mach. Co., Brazil, Ind.

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Relieving
Cleveland Milling Mach. Co., Cleveland, Ohio.

Lathes, Speed and Hand
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Machine Co., Providence, R. I.
Garvin Machine Co., N. Y. City.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

Lathes, Threading
Automatic Mach. Co., Bridgeport, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.

Lathes, Vertical Turret
Bullard Mach. Tool Co., Bridgeport, Conn.

Lathes, Wood Turning
Barnes Co., W. F. & John, Rockford, Ill.
Blount Co., J. G., Woodland St., Everett, Mass.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

Letters and Figures
Brown & Sharpe Mfg. Co., Providence, R. I.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Pannier Bros. Stamp Co., Pittsburgh, Penn.

Lighting Fixtures
Miller Saw Trimmer Co., Pittsburgh, Pa.

Lockers, Clothes
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.

Lubricants
Fiske Bros. Refining Co., 24 State St., N. Y. City.
Oakley Chemical Co., 24 Thames St., N. Y. City.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Lubricating Systems
Bowser & Co., S. F., Fort Wayne, Ind.

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Athol Machine Co., Athol, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Keystone Reamer & Tool Co., Millersburg, Pa.
Pratt & Whitney Co., Hartford, Conn.
Randall & Stickney, Waltham, Mass.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Tool Co., Orange, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

Mandrels, Expanding
American Pneumatic Chuck Co., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cochrane-Bly Co., Rochester, N. Y.
Manufacturers Equipment Co., Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Western Tool & Mfg. Co., Springfield, Ohio.

Mandrels, Solid
Advance Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lincoln Twist Drill Co., Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit.

Marking Devices (See Stamps, Steel)

Marking Machines
Engravers & Printers Mch. Co., Sag Harbor, N. Y.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Measuring Machines
Pratt & Whitney Co., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Metal Cleaning Equipment
Pangborn Corp., Hagerstown, Md.

Metal Finishes
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

Metals, Alloy
Hardite Metals, Inc., 3 Park Row, N. Y. C.
International Nickel Co., N. Y. City.

Meters, Steam Flow
General Electric Co., Schenectady, N. Y.

Micrometer Calipers
Almond Mfg. Co., T. R. Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Randall & Stickney, Waltham, Mass.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S. Athol, Mass.

Milling Attachments
Adams Co., 1902 Bridge St., Dubuque, Iowa
American Pneumatic Chuck Co., Chicago, Ill.
Becker Milling Machine Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Hall Gas Engine Co., Bridesburg, Philadelphia.
Hendey Machine Co., Torrington, Conn.
Ingersoll Milling Machine Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach Tool Co., R. K., Cincinnati, O.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sloan & Chace Mfg. Co., Newark, N. J.
Standard Engineering Wks., Pawtucket, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Whiting & Comstock, Hartford, Conn.

Milling Machines, Automatic
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.

Milling Machines, Bench
Ames Co., B. C., Waltham, Mass.
Carter & Hakes Machine Co., Winsted, Conn.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Hand
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carter & Hakes Mach. Co., Winsted, Conn.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Standard Engineering Co., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio
Van Norman Mach. Tool Co., Springfield, Mass
Whitney Mfg. Co., Hartford, Conn.
Wisconsin Miller Mfg. Co., Station A, Milwaukee.

Milling Machines, Horizontal and Planer Type
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Beaman & Smith Co., Providence, R. I.
Betts Machine Co., Rochester, N. Y.
Ingersoll Milling Mach. Co., Rockford, Ill.
Newton Mach. Tool Works, Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Milling Machines, Plain
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bilton Mach. Tool Co., Bridgeport, Conn.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Mach. Tool Co., Chicago, Ill.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Fox Machine Co., Jackson, Mich.
Garvin Machine Co., N. Y. City.
Gooley & Edlund, Cortland, N. Y.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., The R. K., Cincinnati,
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Rockford Milling Machine Co., Rockford, Ill.
Standard Engineering Wks., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Portable
Newton Mach. Tool Works, Philadelphia, Penn.
Underwood, Corp., H. B., Philadelphia, Penn.

Milling Machines, Thread
Automatic Mach. Co., The, Bridgeport, Conn.
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison, Wis.
Hall Gas Engine Co., Bridesburg, Philadelphia.
Harrington Son & Co., Edwin, Philadelphia, Pa
Lees-Bradner Co., Cleveland, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Pratt & Whitney Co., Hartford, Conn.
Waltham Mach. Works, Waltham, Mass.

Milling Machines, Universal
Becker Milling Mach. Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y. City.
Hendey Mach. Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati, Ohio.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Machine Co., Pawtucket, R. I.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Clough, R. M., Meriden, Conn.
Cochrane-Bly Co., Rochester, N. Y.
Garvin Machine Co., N. Y. City.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Mach. Co., 3920 W. Pine St., St. Louis.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Newton Mach. Tool Works, Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Rockford Milling Machine Co., Rockford, Ill.
Stamets, William K., Pittsburgh, Pa.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Worm
Cleveland Auto. Mach. Co., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Waltham Mach. Works, Waltham, Mass.

Motors, Electric
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Mechanical Appliance Co., Milwaukee, Wis.
Reliance Electric & Engineering Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wisconsin Electric Co., Racine, Wis.

Nickel Plating Outfits
Cutter & Wood Supply Co., Boston, Mass.

Nut Tappers (See Bolt and Nut Machinery)

Nuts, Lock (See Lock-Nuts)

Oil and Grease Cups
Bay State Stamping Co., Worcester, Mass.
Bowen Products Corp., Auburn, N. Y.
Galco, Ltd., A. B., 8 W. 40 St., N. Y. City.
Gits Bros. Mfg. Co., Chicago, Ill.
Tucker, W. A. & C. F., Hartford, Conn.
Wahlstrom Tool Co., Brooklyn, N. Y.

Oilers
Gem Mfg. Co., Pittsburgh, Penn.

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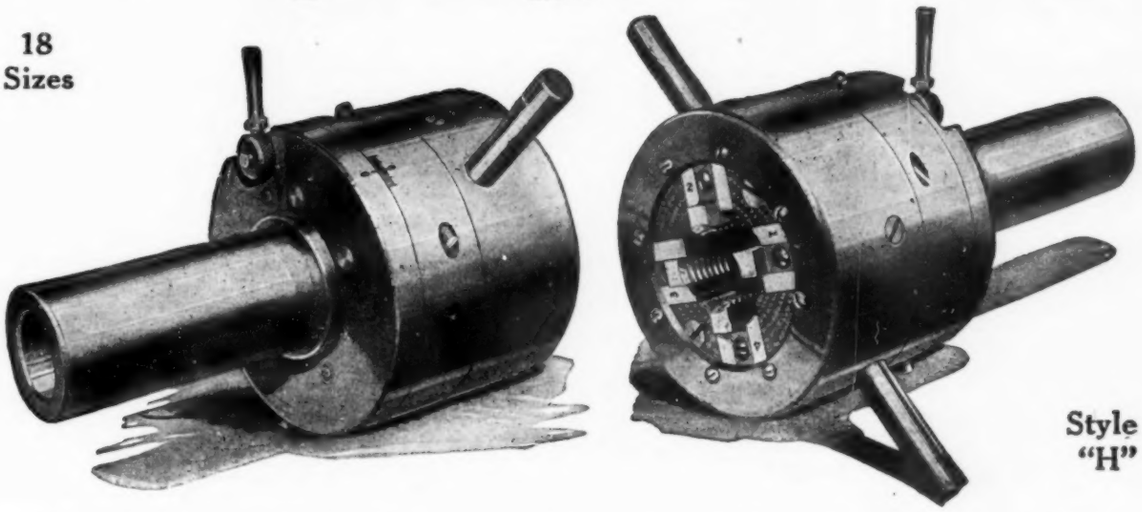

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Fischer Machine Co., Philadelphia, Pa.
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Oil Stones
Norton Co., Worcester, Mass.

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Fiske Bros. Refining Co., 24 State St., N. Y. City.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

Oils, Soluble
Fiske Bros. Refining Co., 24 State St., N. Y. City.

Oxygen
Davis-Bournonville Co., Jersey City, N. J.

Packing, Hydraulic
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.
Sweet & Doyle F. & M. Co., Green Island, N. Y.

Paints, Machinery
Hilo Varnish Corp., 8 Gerry St., Bklyn., N. Y.

Pattern Shop Machinery (See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mach. Tool & Die Co., Roselle, N. J.
Sweet & Doyle F. & M. Co., Green Island, N. Y.

Pipe Bending Machines
Baird Pneumatic Tool Co., Kansas City, Mo.
Harrington Son & Co., Edwin, Phila., Penn.
Treadwell Eng'g. Co., 88 West St., N. Y. City.
Underwood Corp., H. B., Philadelphia, Penn.

Pipe Cutting and Threading Machines
Bignall & Keeler Mach. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Harrington, Son & Co., Edwin, Philadelphia, Pa
Landis Mach. Co., Waynesboro, Penn.
Murchey Mach. & Tool Co., Detroit, Mich.
Saunders Sons, D., Yonkers, N. Y.
Standard Eng'g. Wks., Ellwood City, Penn.
Treadwell Eng'g. Co., 88 West St., N. Y. City
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.

Pipe Fitters' Tools
Butterfield & Co., Derby Line, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Saunders Sons, D., Yonkers, N. Y.
Standard Tool Co., Cleveland, Ohio.
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.
Williams & Co., J. H., 35 Richard St., Brooklyn.

Piston Ring Machines
National Acme Co., Windsor, Vt.
Persons-Arter Machine Co., Worcester, Mass.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Hartford, Conn.
Walker Co., O. S., Worcester, Mass.

Planer Parallels
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

Planing Machines
American Tool Wks. Co., Cincinnati, Ohio.
Betts Machine Co., Rochester, N. Y.
Cincinnati Planer Co., Cincinnati, Ohio.
Cleveland Planer Co., Cleveland, Ohio.
Gray Co., G. A., Cincinnati, Ohio.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Liberty Mach. Tool Co., Hamilton, Ohio.
Lynd-Farquhar Co., Boston, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Ohio Mach. Tool Co., Kenton, Ohio.
Powell Machine Co., Worcester, Mass.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sellers & Co., Wm., Philadelphia, Penn.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.

Planing Machines, Rotary
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Underwood Corp., H. B., Philadelphia, Penn.

Plate Rolls
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

Pneumatic Tools
American Pneumatic Chuck Co., Chicago, Ill.
Anderson Bros. Mfg. Co., Rockford, Ill.
Baird Pneumatic Tool Co., Kansas City, Mo.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Bway, N. Y. City.

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford, Ill.
Blanchard Mach. Co., Cambridge, Mass.
Blevney Machine Co., Greenfield, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cutter & Wood Supply Co., Boston, Mass.
Diamond Mach. Co., Providence, R. I.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Gardner Machine Co., Beloit, Wis.
Goodell-Pratt Co., Greenfield, Mass.
Greenfield Mach. Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Mach. Co., Worcester, Mass.
Holtzer-Cabot Electric Co., Boston
Independent Pneumatic Tool Co., Chicago, Ill.
Landis Tool Co., Waynesboro, Penn.
New Britain Mach. Co., New Britain, Conn.
Newton Mach. Tool Wks., Philadelphia, Penn.
Norton Co., Worcester, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
Rivett Lathe & Grinder Co., Brighton, Boston
Rowbottom Mach. Co., Waterbury, Conn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Safety Emery Wheel Co., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Dorn Electric Tool Co., Cleveland, Ohio.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker & Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Wisconsin Electric Co., Racine, Wis.

Pots, Steel
Eclipse Fuel Engineering Co., Rockford, Ill.

Pressed Steel Parts
Acklin Stamping Co., 1655 Dorr St., Toledo, O.
New Britain Mach. Co., New Britain, Conn.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Geier Co., P. A., Cleveland, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Wilmarth & Morman Co., Grand Rapids, Mich.

Presses, Banding
Metalwood Mfg. Co., Detroit, Mich.

Presses, Broaching
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.

Presses, Drop and Forging
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Elmes Eng. Wks., Chas. F., Chicago, Ill.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Toledo Mach. & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Ferracute Mach. Co., Bridgeton, N. J.
Shuster Co., F. B., New Haven, Conn.
Taylor & Fenn Co., Hartford, Conn.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Lucas Mach. Tool Co., Cleveland, Ohio.
Metalwood Mfg. Co., Detroit, Mich.

Presses, Hydraulic
Elmes Engineering Wks., Chas. F., Chicago.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Watson-Stillman Co., 42 Church St., N. Y. City.

Presses, Power
Barnes Co., W. F. & John, Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Rowbottom Mach. Co., Waterbury, Conn.
Toledo Mach. & Tool Co., Toledo, Ohio.
Stoll Co., Inc., D. H., Buffalo, N. Y.
V & O Press Co., Glendale, L. I., N. Y.

Presses, Screw
Barnes Co., W. F. & John, Rockford, Ill.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.

Profiling Machines
Becker Milling Mach. Co., Hyde Park, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Fischer Machine Co., Philadelphia, Pa.
Garvin Machine Co., N. Y. City.
Newton Mach. Tool Wks., Philadelphia, Penn.
Pratt & Whitney Co., Hartford, Conn.
Stark Tool Co., Waltham, Mass.
Wade-American Precision Tool Co., Boston.

Publishers
McGraw-Hill Book Co., 239 W. 39th St., N. Y. C.

Pulley Turning and Boring Machines
American Tool Wks. Co., Cincinnati, Ohio.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Wilmarth & Morman Co., Grand Rapids, Mich.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.

Pulleys, Metal
American Pulley Co., Philadelphia, Pa.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Brown & Sharpe Mfg. Co., Providence, R. I.
Caldwell & Son Co., H. W., Chicago, Ill.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Transmission Ball Bearing Co., Buffalo, N. Y.
Wilmarth & Morman Co., Grand Rapids, Mich

Pulleys, Paper
Rockwood Mfg. Co., Indianapolis, Ind.

Pumps, Hydraulic
Elmes Engineering Wks., Chas. F., Chicago.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Wilmarth & Morman Co., Grand Rapids, Mich.
Worthington Pump & Mchy. Corp., N. Y. City.

Pumps, Lubricant and Oil
Bowser & Co., S. F., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fulflo Pump Co., Blanchester, Ohio.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Hudson Pump Co., Jersey City, N. J.
Michigan Machine Co., Detroit, Mich.
Trahern Pump Div., Geo. D. Roper Corp, Rockford, Ill.
Volyum Pump Co., 419 W. Liberty St., Cincinnati
Worthington Pump & Mchy. Corp., N. Y. City.

Pumps, Power
Bowser & Co., S. F., Fort Wayne, Ind.
Ingersoll-Rand Co., 11 Bway., N. Y. City.
Worthington Pump & Mchy. Corp., N. Y. City.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago, Ill.

Punches, Power
Baird Pneumatic Tool Co., Kansas City, Mo.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Ferracute Mach. Co., Bridgeton, N. J.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Watson-Stillman Co., 42 Church St., N. Y. City.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Penn.
Englehard, Chas., 30 Church St., N. Y. City.
Taylor Instrument Cos., Rochester, N. Y.

Rack Cutting Machines
Gould & Eberhardt, Newark, N. J.
Sloan & Chace Mfg. Co., Newark, N. J

Racks, Cut
Moltrup Steel Products Co., Beaver Falls, Pa.
Van Dorn & Dutton Co., Cleveland, Ohio.

Racks, Storage (See Furniture, Machine Shop)

Radiators, Japanning Oven
American Gas Furnace Co., 24 John St., N. Y. C.
Chicago Flexible Shaft Co., Chicago, Ill.

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence, R. I.
Ingersoll-Rand Co., 11 Bway., N. Y. City.

Rawhide, Rope
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

Reamer Holders
Gisholt, Mach. Co., Madison, Wis.
Independent Pneumatic Tool Co., Chicago, Ill

Reamers, Expanding
Advance Tool Co., Cincinnati, Ohio.
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Cashman Tool Co., Waynesboro, Pa.
Clough, R. M., Meriden, Conn.
Cutter & Wood Supply Co., Boston, Mass.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall Mfg. Co., Abington, Mass.
Keystone Reamer & Tool Co., Millersburg, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Reamers, Solid
Advance Tool Co., Cincinnati, Ohio.
American Machine Products Co., Detroit.
Bay State Tap & Die Co., Mansfield, Mass.
Brewster Co., Wm., 30 Church St., N. Y. City
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Buckeye Twist Drill Co., Alliance, Ohio.
Butterfield & Co., Derby Line, Vt.
Clark Equipment Co., Buchanan, Mich.
Detroit Reamer & Tool Co., Detroit, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kelly Reamer Co., Cleveland, Ohio.
Keystone Reamer & Tool Co., Millersburg, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland, Ohio.
National Twist Drill & Tool Co., Detroit.
Reed Mfg. Co., Erie, Pa.
Skelton Tool Co., Syracuse, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

Reamers, Taper
American Machine Products Co., Detroit.
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Reamer & Tool Co., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keystone Reamer & Tool Co., Millersburg, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.
S. & C. Mfg. Co., Penobscot Bldg., Detroit.

Recorders, Pressure
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Penn.

Recorders, Temperature
Bristol Co., Waterbury, Conn.
Taylor Instrument Cos., Rochester, N. Y.

Recorders, Time
Calculagraph Co., 30 Church St., N. Y. City.
Gisholt Mach. Co., Madison, Wis.

Resistance Material
Driver-Harris Co., Harrison, N. J.

Rheostats
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

Rivet Making Machinery
Cook Co., Asa S., Hartford, Conn.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Baird Pneumatic Tool Co., Kansas City, Mo.
Bilton Mach. Tool Co., Bridgeport, Conn.
Birdsboro Steel F. & M. Co., Birdsboro, Penn.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Bway., N. Y. City.
Shuster Co., F. B., New Haven, Conn.
Thomson Spot Welder Co., Lynn, Mass.
Townsend Mfg. Co., H. P., Hartford, Conn.

Rod Cutters
Tucker, W. A. & C. F., Hartford, Conn.

Rolling Mill Equipment
Blake & Johnson Co., Waterbury, Conn.
Standard Eng'g. Wks., Ellwood City, Penn.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R. I.
Goodell-Pratt Co., Greenfield, Mass.
Hammacher, Schlemmer & Co., N. Y. City.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

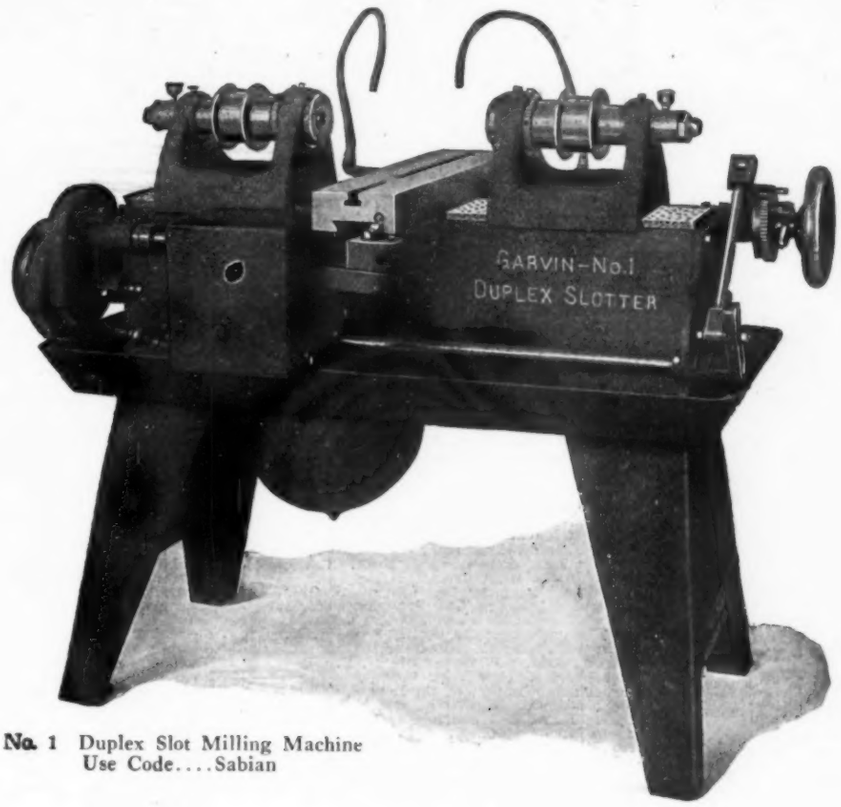
Rust Preventatives
Oakley Chemical Co., 24 Thames St., N. Y. City.

Sand-Blast Apparatus
Hoevel Mfg. Corp., 50 Church St., N. Y. City.
Pangborn Corporation, Hagerstown, Md.
Paxson Co., J. W., Philadelphia, Penn.

Sand Equipment
Pangborn Corporation, Hagerstown, Md.

Sanders
Syracuse Sander Mfg. Co., Sander, N. Y. C.

Sand Rammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, Ohio
Independent Pneumatic Tool Co., Chicago, Ill.



No. 1 Duplex Slot Milling Machine
Use Code....Sabian

THE above is a new addition to our line and offers large results in reducing the cost and increasing the production of milling slots in spindles, tool-post slots, elongated holes, key-ways, slots in castings, tools, etc., mortise cuts, open fork ends, etc. It is full automatic, stops cutting when work is finished; it only being necessary to put in piece, and the machine will do the work without further attention.

In milling a through slot, automatic provision is made to back away one head, so the other head can complete the slot. Changes of feed by cone and gears. Changes of speed by friction cone on countershaft.

The capacity of the machine is extensive, milling slots from ¼ in. to 4 in. long, ¼ in. wide to 1½ in. wide, clear through the work, up to 4 in. in diameter, or 2 in. on a side, in steel or other material. Weight of machine, 1600 lb.

FOR FURTHER INFORMATION ASK YOUR DEALER OR WRITE US DIRECT

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Saw Frames and Blades, Hack
American Saw & Mfg. Co., Springfield, Mass.
Diamond Saw & Stamping Wks., Buffalo, N. Y.
Goodell-Pratt Co., Greenfield, Mass.
Hammacher, Schlemmer & Co., N. Y. City.
Racine Tool & Mach. Co., Racine, Wis.
Simonds Mfg. Co., Fitchburg, Mass.
Starrett Co., L. S., Athol, Mass.
Thompson & Son Co., Hy. G., New Haven, Conn.
Union Tool Co., Orange, Mass.
Victor Saw Works, Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago, Ill.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cochrane-Bly Co., Rochester, N. Y.
Diamond Saw & Stamping Wks., Buffalo, N. Y
Earle Gear & Mach. Co., Philadelphia, Penn.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
Peerless Mach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Swind Machinery Co., Philadelphia, Pa.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.
Victor Saw Wks., Springfield, Mass.

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago, Ill.
Diamond Saw & Stamping Wks., Buffalo, N. Y.
Goodell-Pratt Co., Greenfield, Mass.
Peerless Mach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Thompson & Son Co., Hy. G., New Haven, Conn.
Victor Saw Wks., Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.
Western Tool & Mfg. Co., Springfield, Mass.

Saw Sharpening Machines
Cochrane-Bly Co., Rochester, N. Y.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Hunter Saw & Mach. Co., Pittsburgh, Penn.

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Barber-Coleman Co., Rockford, Ill.
Cochrane-Bly Co., Rochester, N. Y.
Hunter Saw & Machine Co., Pittsburgh, Penn.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.
Simonds Mfg. Co., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

Saws, Hand
Reliance Steel & Tool Co., 24 Murray St., N. Y.

Saws, Metal Band
American Saw & Mfg Co., Springfield, Mass.
Garvin Machine Co., N. Y. City.
Hunter Saw & Mach. Co., Pittsburgh, Penn.
Racine Tool & Mach. Co., Racine, Wis.
Silver Mfg. Co., Salem, Ohio.
Simonds Mfg. Co., Fitchburg, Mass.

Saws, Metal Cutting
Brown & Sharpe Mfg. Co., Providence, R. I.
Cochrane-Bly Co., Rochester, N. Y.
Hunter Saw & Mach. Co., Pittsburgh, Penn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.

Saws, Milling
Brown & Sharpe Mfg. Co., Providence, R. I.
Lincoln Twist Drill Co., Taunton, Mass.
Thurston Mfg. Co., Providence, R. I.

Saws, Screw Slotting
Brown & Sharpe Mfg. Co., Providence, R. I.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Simonds Mfg. Co., Fitchburg, Mass.
Starrett Co., L. S., Athol, Mass.
Thurston Mfg. Co., Providence, R. I.
Union Twist Drill Co., Athol, Mass.

Saw Tables, Universal
Baker Bros., Toledo, Ohio.
Silver Mfg. Co., Salem, Ohio.

Scales
Brown & Sharpe Mfg. Co., Providence, R. I.

Scraping Tables
New Britain Machine Co., New Britain, Conn.

Screw Driving Machines
Hergi Mfg. Co., 75 3rd St., Bridgeport, Conn.
Reynolds Machine Co., Massillon, Ohio.

Screw Machine Racks
New Britain Machine Co., New Britain, Conn.

Screw-Machine Work
Ansonia Mfg. Co., Ansonia, Conn.
Atlantic Mfg. Co., Milford, Conn.
Brown Engineering Co., Reading, Pa.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Corbin Screw Corp., New Britain, Conn.
Dallett Co., Thos. H., Philadelphia, Penn.
Eastern Mach. Screw Corp., New Haven, Conn.
Ericsson Screw Mach. Products Co., Brooklyn.
Hartford Machine Screw Co., Hartford, Conn.
Link-Belt Co., Philadelphia, Chicago.
National Acme Co., Cleveland, Ohio.
National Mach. Tool Co., Cincinnati, Ohio.
New Britain Machine Co., New Britain, Conn.
Spafford Tool Wks., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tock Screw Mach. Products Corp., L. I. City.
Union Tool Co., Orange, Mass.
Whiting & Comstock, Hartford, Conn.
Zumbach Machine Co., 134 W. 54th St., N. Y. C.

Screw Machy., Wood and Lag
Cook Co., Asa S., Hartford, Conn.
Townsend Mfg. Co., H. P., Hartford, Conn.

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Cleveland Automatic Mach. Co., Cleveland, Ohio.
Cone Automatic Machine Co., Windsor, Vt.
Davenport Mach. Tool Co., New Bedford, Mass.
Hartford Machine Screw Co., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
New Britain Mach. Co., New Britain, Conn.
P. W. Y. Auto Machine Corp., Fitchburg, Mass.
Reynolds Machine Co., Massillon, Ohio.
Townsend Mfg. Co., H. P., Hartford, Conn.

Screw Machines, Plain or Hand
Acme Mach. Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dreses Mach. Tool Co., Cincinnati, O.
Foster Mach. Co., Elkhart, Ind.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Milholland Mach. Co., Indianapolis, Ind.
Warner & Swasey Co., Cleveland, Ohio.
Wood Turret Mach. Co., Brazil, Ind.

Screw Plates
Bay State Tap & Die Co., Mansfield, Mass.
Brubaker & Bros., W. L., 50 Church St., N. Y. C.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Gardner-Bryan Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

Screws, Cap and Set
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Hammacher, Schlemmer & Co., N. Y. City.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hammacher, Schlemmer & Co., N. Y. City.

Screws, Safety Set
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Hammacher, Schlemmer & Co., N. Y. City.

Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery
(See Searchlight Section)
American Can Co., New York City
American Machinery Exchange, N. Y. C.
Badger-Packard Machinery Co., Milwaukee.
Barbour, Love & Woodward, N. Y. City.
Bosworth, W. H., Cleveland, Ohio
Broadway Machinery Co., Cincinnati, Ohio.
Brownell Machinery Co., Providence, R. I.
Calumet Iron & Metal Co., Chicago, Ill.
Carter Machinery Sales Co., Buffalo, N. Y.
Cincinnati Planer Co., Cincinnati, Ohio.
Duff Co., J. E., 247 Center St., N. Y. City
Fairbanks Co., New York City
Fales Machinery Co., C. E., Detroit.
Ford Motor Co., Highland Park, Mich.
Freidus Bros., 253 Centre St., N. Y. City.
Garvin Machine Co., N. Y. City.
Gelb & Co., J., 201 Centre St., N. Y. City.
Graves Machinery Exchange, N. Y. City.
Greaves-Klusman Tool Co., Cincinnati.
Hannan-Finton Co., Springfield, Mass.
Hermance Machine Co., Williamsport, Pa.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hyde Park Mfg. Co., Hyde Park, Mass.
Industrial Machy. Corp., Jersey City, N. J.
Kaeser Co., New Haven, Conn.
Kinsey Co., E. A., Cincinnati, Ohio.
Lamberg & Co., A., New York City.
Lynd-Farquhar Co., 419 Atlantic Ave., Boston.
McDonough Mfg. Co., Eau Claire, Wis.
McMullen Machinery Co., Grand Rapids, Mich.
Marshall & Huschart Machy. Co., Chicago.
Modern Machinery Exchange, N. Y. City.
Morey & Co., 50 Church St., New York City.
Morris Machinery Co., Newark, N. J.
Morton Machinery Co., 139 3d St., Phila.
Motch & Merryweather Mchy. Co., Cleveland.
New Jersey Machinery Exchange, Newark, N. J.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Noble Machinery Co., New York City
Pattison Supply Co., W. M., Cleveland.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Prichard Co., C. W., New York City
Richmond Forgings Co., Richmond, Va.
Russian-Remington R. C. Trustees, N. Y. City
Ryerson Co. Joseph, Chicago, Ill.
Saxer Machinery Co., Erie, Pa.
Schoonmaker & Sons, A. G., N. Y. City.
Simmons Mach. Co., Inc., 149 B'way, N. Y. City.
Stickley Mach. Co., E. B., Detroit, Mich.
Toomey, Frank, 127 N. 3rd St., Philadelphia, Pa.
Vonnegut Machinery Co., Indianapolis, Ind.
Walsh Machinery Co., M. J., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
Winterer, Herman L., Philadelphia.
Zelnicker Supply Co., W. A., St. Louis, Mo.

Separators, Moisture and Oil
Pangborn Corporation, Hagerstown, Md.

Separators, Oil and Waste
Oil & Waste Saving Mach. Co., Philadelphia, Pa.

Shafting
Aborn Steel Co., 22 Clarke St., N. Y. City.
Columbia Steel & Shafting Co., Pittsburgh, Penn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Union Drawn Steel Co., Beaver Falls, Penn.

Shafts, Crank and Jack
Standard Gauge Steel Co., Beaver Falls, Penn.

Shapes, Cold-Drawn Special Steel
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Moltrup Steel Products Co, Beaver Falls, Pa.
New England Drawn Steel Co., Mansfield, Mass.
Union Drawn Steel Co., Beaver Falls, Penn.

Shaping Machines
American Tool Works Co., Cincinnati, Ohio.
Cincinnati Shaper Co., Cincinnati, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Columbia Mach. Tool Co., Hamilton, Ohio.
Davis Machine Tool Co., Rochester, N. Y.
Gould & Eberhardt, Newark, N. J.
Hendey Mach. Co., Torrington, Conn.
Kelly Co., R. A., Box 488 Xenia, O.
Lynd-Farquhar Co., Boston, Mass.
Mattison Machine Co., Rockford, Ill.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Oakley Mach. Tool Co., Cincinnati, Ohio.
Ohio Mach. Tool Co., Kenton, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Rhodes Mfg. Co., Hartford, Conn.
Sellew Machine Tool Co., Pawtucket, R. I.
Smith & Mills Co., Cincinnati, Ohio.
Springfield Mach. Tool Co., Springfield, Ohio.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Stockbridge Machine Co., Worcester, Mass.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago, Ill.
Tucker, W. A. & C. F., Hartford, Conn.

Shears, Power
Birdsboro Steel F. & M. Co., Birdsboro, Pa.
Ferracute Mach. Co., Bridgeton, N. J.
Hilles & Jones Co., Wilmington, Del.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Stoll Co., D. H., Buffalo, N. Y.
Toledo Mach. & Tool Co., Toledo, Ohio.

Sheet Metal Working Machinery
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Works, Buffalo, N. Y.
Savage Co., W. J., Knoxville, Tenn.
Toledo Mach. & Tool Co., Toledo, Mich.

Shelving, Steel (See Furniture, Machine Shop)

Shims
Laminated Shim Co., 533 Canal St., N. Y. C.

Slotting Machines
Betts Machine Co., Rochester, N. Y.
Cochrane-Bly Co., Rochester, N. Y.
Dill Machine Co., T. C., Philadelphia, Pa.
Garvin Mach. Co., N. Y. City.
Newton Machine Tool Wks., Philadelphia, Penn
Sellers & Co., Wm., Philadelphia, Penn.

Sockets and Sleeves
Clark Equipment Co., Buchanan, Mich.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.

Special Machinery and Tools
American Pneumatic Chuck Co., Chicago, Ill.
Arrow Tool Co., Bridgeport, Conn.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bicknell-Thomas Co., Greenfield, Mass.
Bilgram Mach. Wks., Philadelphia, Penn.
Blake & Johnson Co., Waterbury, Conn.
Boston Scale & Mach. Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Columbus Die Tool & Mach. Co., Columbus, O.
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
Davis-Bournonville Co., Jersey City, N. J.
Dexter I. H. Co., 27 Walker St., N. Y. C.
Earle Gear & Mach. Co., Philadelphia, Pa.
Feeney Tool Co., Bridgeport, Conn.
Fischer Machine Co., Philadelphia, Pa.
Franklin Machine Co., Providence, R. I.
Garvin Machine Co., N. Y. City.
Gem City Machine Co., Dayton, Ohio.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Grover File Co., Nashua, N. H.
Hartford Special Mchy. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Lambert & Todd Mach. Co., Camden, N. J.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Lincoln Machine Co., Pawtucket, R. I.
Marvin & Casler Co., Canastota, N. Y.
Mehl Machine Tool & Die Co., Roselle, N. J
Nazel Engineering & Machine Wks., Philadelphia.
Newton Machine Tool Works, Philadelphia, Penn
Oxweld Acetylene Co., Chicago, Ill.
Parker Mach. Co., 221 High St., Boston.
Peerless Machine Co., Racine, Wis.
Reynolds Machine Co., Massillon, Ohio.
Robbins, Gamwell & Co., Pittsfield, Mass.
Rogers Machine Tool Co., Salamanca, N. Y.
Rowbottom Machine Co., Waterbury, Conn.
Service Engineering Co., N. Y. City.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Slocum, Avram & Slocum Lab., Newark, N. J.
Steel Products Engineering Co., Springfield, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Terkelsen & Wennberg, Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Wade-American Precision Tool Co., Boston.
Waltham Mach. Wks., High St., Waltham, Mass.
West & Dodge Co., Boston, Mass.
Whiting & Comstock, Hartford, Conn.

Springs
Cook & Co., Chas. A., Brooklyn, N. Y.

Sprockets and Chains
Baldwin Chain & Mfg. Co., Worcester, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Caldwell & Son Co., H. W., Chicago, Ill.
Cullman Wheel Co., 1349 Altgeld St., Chicago
Grant Gear Works, 151 Pearl St., Boston, Mass.
Link-Belt Co., Chicago, Philadelphia.
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

Squares
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

Stampings, Metal
Acklin Stamping Co., 1655 Dorr St., Toledo, O.
American Pulley Co., Philadelphia, Pa.
Bay State Stamping Co., Worcester, Mass.
Beaver Machine & Tool Co., Newark, N. J.
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cook & Co., Chas. A., Brooklyn, N. Y.
Detroit Stamping Co., 951 W. Fort St., Detroit.
Gem Mfg. Co., Pittsburgh, Pa.
Kales Stamping Co., Detroit, Mich.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Root Co., C. J., Bristol, Conn.
Toledo Bridge & Crane Co., Toledo, Ohio.

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Better in Every Way

Patent sections are better in every way than any other high-speed steel. They are stronger—they don't break—there's no waste—and no forging to add to your cost. Then consider that section I has 40% less weight than the solid bar high-speed steel and section Z 35%.

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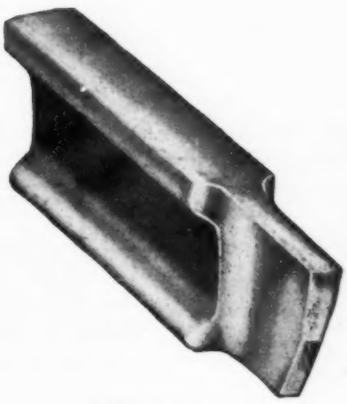

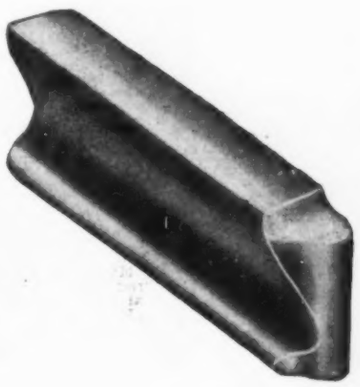

SECTION I

⅜ x ¾
½ x 1
⅝ x 1¼
¾ x 1½

SECTION Z

⅜ x ¾
½ x 1
⅝ x 1¼
¾ x 1½
1 x 2

Of course we can also give you from stock solid flats, rounds and squares when you need them.

"The High-Speed Steel Without An Equal"

H. BOKER & CO., Inc.

Established 1837

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Noble & Westbrook Mfg. Co., Hartford, Conn.
Pannier Bros. Stamp Co., Pittsburgh, Pa.

Stanchions, Machine Guard & Guard Rail
New Britain Machine Co., New Britain, Conn.

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence, R. I.
Eclipse Fuel Engineering Co., Rockford, Ill.

Steel, Cold Rolled Strip
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cyclops Steel Co., 120 Broadway, N. Y. City.
Hawkridge Bros. Co., 303 Congress St., Boston.

Steel Hardness Measuring Instruments
Shore Instrument & Mfg. Co., N. Y. City.

Steel Scrap Reclamation
Onondaga Steel Co., Inc., Syracuse, N. Y.

Steel, Shafting and Free Cutting Screw
Aborn Steel Co., 22 Clarke St., New York City.
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Columbia Steel & Shafting Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, New York City.
Hawkridge Bros. Co., 303 Congress St., Boston.
Moltrup Steel Products Co., Beaver Falls, Pa.
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Union Drawn Steel Co., Beaver Falls, Pa.

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Colonial Steel Co., Pittsburgh, Pa.
Hawkridge Bros. Co., 303 Congress St., Boston
Hobson, Houghton & Co., New York City.
Jessop & Sons, Wm., 91 John St., New York City.
Ward's Sons, Edgar T., Boston, Mass.

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Halcomb Steel Co., Syracuse, N. Y.
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Hobson, Houghton & Co., New York City.
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Jones & Co., B. M., New York City.
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Ludlum Steel Co., Watervliet, N. Y.
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Boker & Co., H., 101 Duane St., New York City.
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Cyclops Steel Co., 120 Broadway, New York City.
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Halcomb Steel Co., Syracuse, N. Y.
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Hess Steel Corp., Baltimore, Md.
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Shuster Co., F. B., New Haven, Conn.
Springfield Mach. Tool Co., Springfield, Ohio.
Standard Engineering Works, Pawtucket, R. I.

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Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
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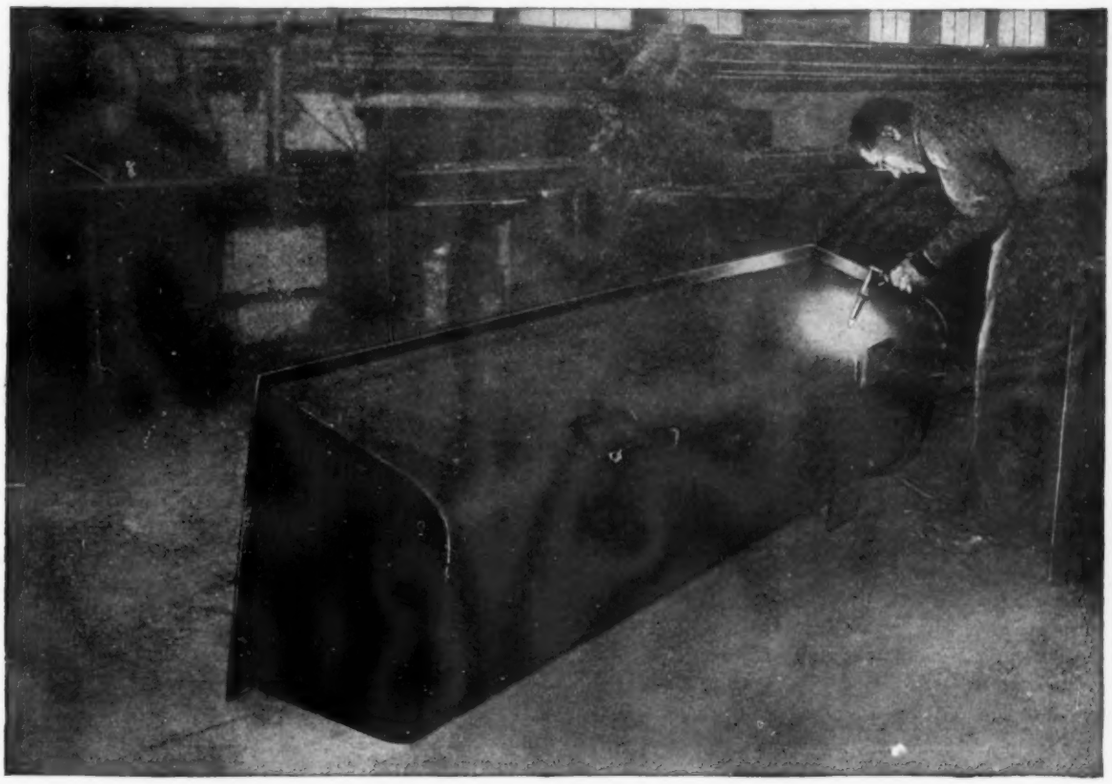

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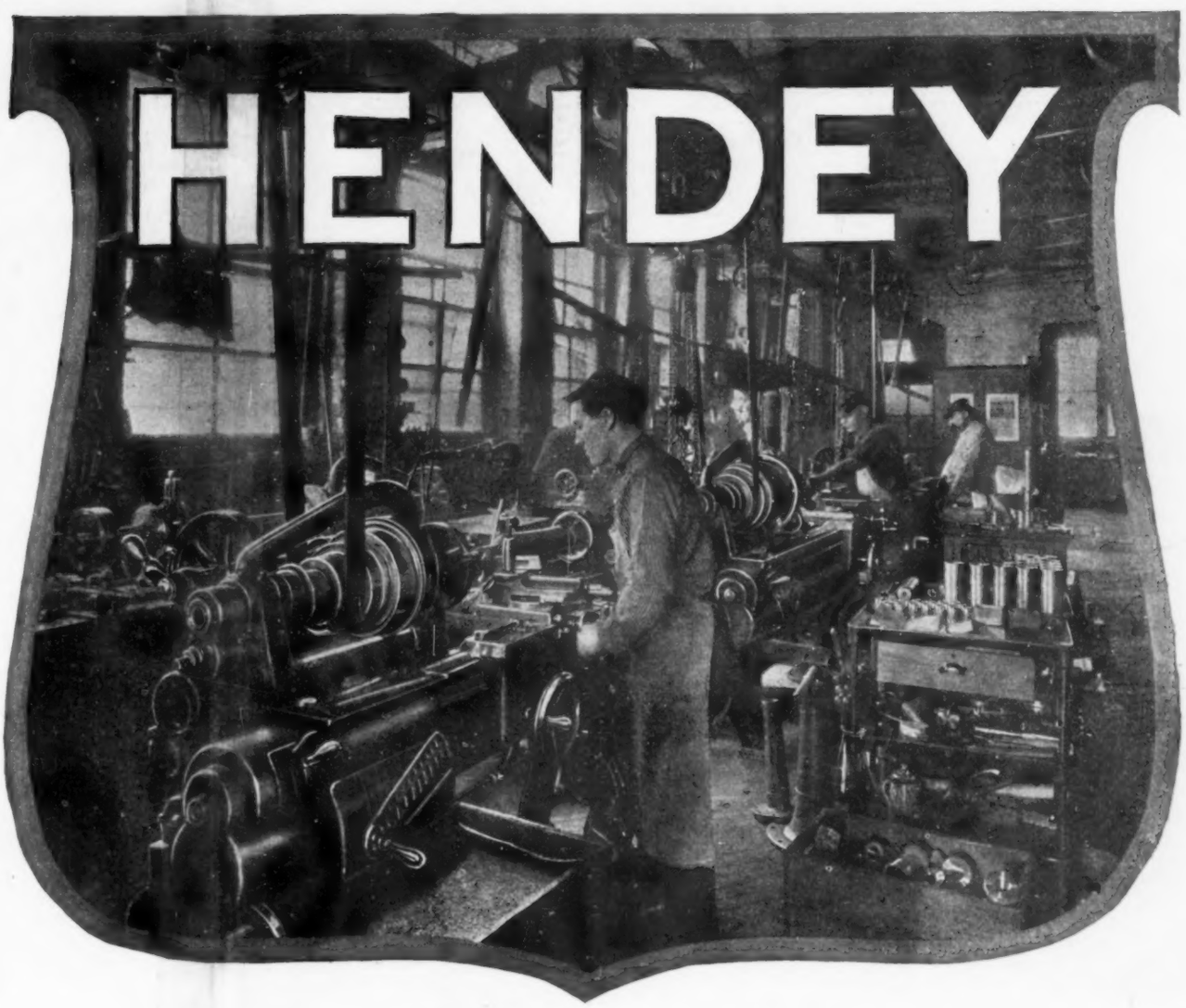

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